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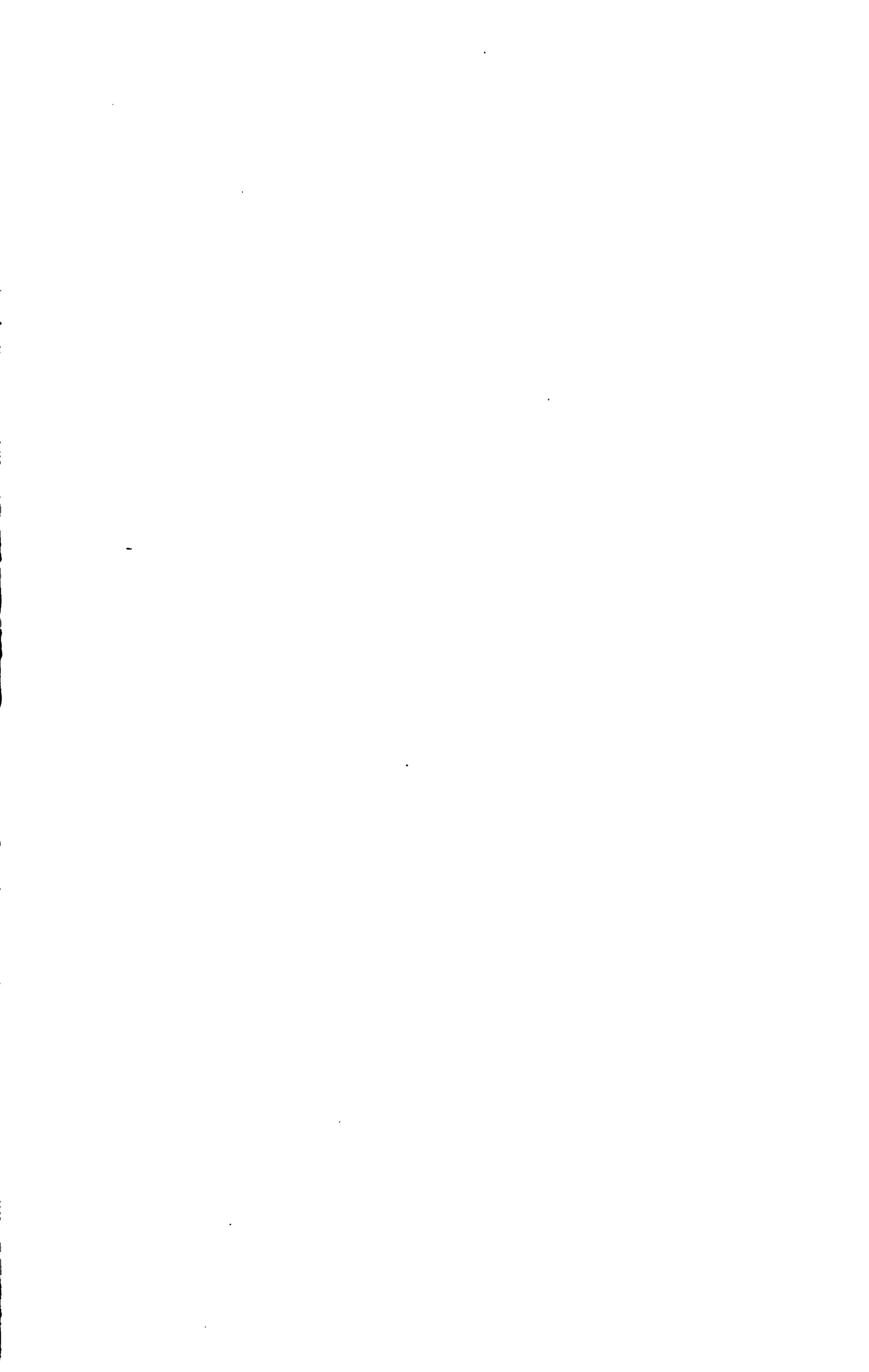
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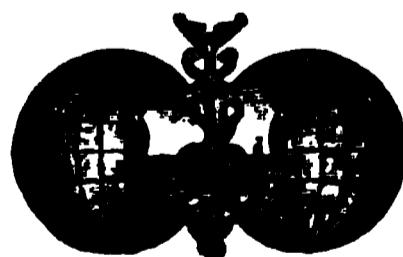
**A YEARLY REPORT OF THE PROGRESS OF THE GENERAL
SANITARY SCIENCES THROUGHOUT THE WORLD.**

EDITED BY
CHARLES E. SAJOUS, M. D.,
AND
SEVENTY ASSOCIATE EDITORS,

ASSISTED BY
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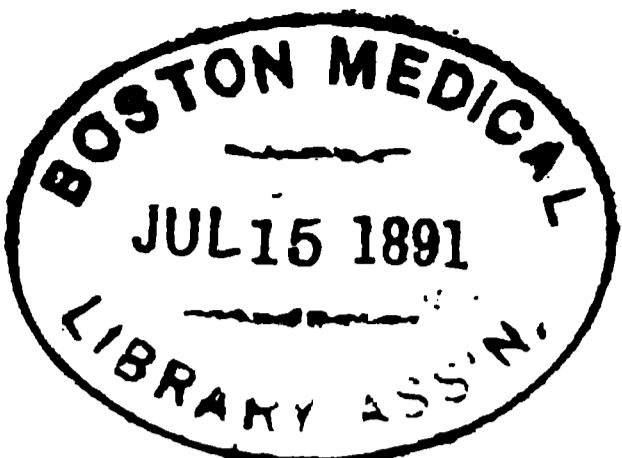
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GENERAL THERAPEUTICS.

BY J. P. CROZER GRIFFITH, M.D.;
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Abrus Precatorius.—Kobert⁸⁰ has isolated an albuminous principle from abrus precatorius which he finds 100 times more poisonous than strychnine, and acting in the same manner on the system as the poisonous principle extracted from castor-oil seeds. According to this writer death is caused by the coagulation of the blood-corpuscles. The same principle was described in last year's ANNUAL by Martin.

Acetanilid.—The drug acetanilid, the copyright name of which is antifebrin, has been much employed during the last year, but as its effects are now well known not many articles of account have appeared in the journals. The later works on therapeutics contain a full description of its therapeutic action and uses. Several cases of recent poisoning are, however, noted.

I. N. Love⁸¹ has used acetanilid in 1100 cases of diseases of children, in 600 of which a record was kept. His conclusions are (1) that, with due care, it is a reliable remedy for infancy and childhood; (2) that the results are of longer duration and the depression not so great as from the use of antipyrin; (3) the cyanosis which may accompany its use is not dangerous and soon passes away; (4) small but repeated doses should be used; (5) in pertussis it lessens the discomforts and keeps the paroxysms in check better than any other remedy. G. Garnette Kemper¹⁸⁶ says that acetanilid is unsurpassed in the after-pains of labor, while W. B. Squire¹⁸⁶ has found a combination of acetanilid with pulv. ipecac. et opium comp. useful in the treatment of bronchitis and rheumatism. Moncorvo^{24, 26} has tested acetanilid for hæmostatic properties with negative results. Stein⁸⁸ has observed 8 grains (0.52 gramme) of acetanilid to produce hallucinations in the weak

and aged. Preininger,⁷⁵⁸ relates a case in which acetanilid seems to have had a cumulative action. W. H. Thomas,⁵⁶ reports a case in which he thinks that 5 grains (0.32 grammes) of acetanilid caused death. The patient, a woman, suffered much from neuralgia of the stomach and head. She was first seen on April 30th, at 10 A.M., with a temperature of 99° F. (37.22° C.) and a pulse of 100. She was given morphia for the relief of pain and bismuth and pepsin to settle the stomach. During the night she had a chill, and when seen at 8 A.M. the next morning she had a temperature of 103° F. (39.44° C.) and a pulse of 120, full and strong. The morphia was stopped, bismuth and pepsin continued, and 2 grains (0.13 grammes) of quinine every two hours were ordered. At 4 P.M. of the same day, temperature 104° F. (40° C.); pulse 120, full and hard; the patient was sponged and 5 grains (0.32 grammes) of acetanilid administered. In half an hour the temperature began to fall, and when seen, at 6.30 P.M., the temperature was 97° F. (36.11° C.) and pulse imperceptible. The respiration was good, feet cold; patient very restless, but perfectly rational. Notwithstanding the best of care and the use of whisky, ether, ammonia, and strychnia, no increase could be obtained in the heart's action. The patient died nine hours after taking the 5 grains (0.32 grammes) of acetanilid. There is no account of a post-mortem, and we presume that none was made. This is unfortunate, as we cannot now exclude other causes for the failure of the heart's action.

Two 15-grain (1 gramme) powders of acetanilid were taken by a woman for that amount of antipyrin. Albert W. Ferris,⁵⁹ who saw the case, found that the acetanilid had increased her headache, and that her pulse was 48 and temperature 97° F. (36.11° C.). J. Vierhuff²¹ was called in to see a patient who had taken 2 teaspoonfuls of antifebrin on an empty stomach. Vomiting was produced by the use of alum shortly after taking the second teaspoonful. She was found, four hours later, to have a pulse of 84; temperature, 36.4° C. (97.5° F.); lips, fingers, and toe-nails blue; livid complexion; pupils contracted, and sensation undisturbed. Collapse, lasting three and one-half hours, came on later. She appeared out of danger fourteen hours after taking the acetanilid. In the way of treatment, the intra-venous injection of common salt seemed to give the best result. A. Hartige,²¹ prints an account of a student, who, having been drinking heavily, feared

that he would not sleep. Accordingly he took teaspoonful doses from a full ounce (32 grammes) box of acetanilid, until the whole had been taken. The writer thinks that the symptoms of poisoning were similar to those described by Déhio as occurring in pure aniline poisoning, but in no way so marked. He calls attention to the fact that about 25 grammes ($6\frac{1}{2}$ drachms) of aniline oil would be used in the preparation of an ounce (32 grammes) of acetanilid. The symptoms produced in this case were not so severe as in that of Vierhuff's patient,²¹ though six times more of the acetanilid was taken. This seems to have been due to the purity of the specimen, it being free from toluidin, and the fact of the stomach containing such a large amount of fluid. Jacob Wolff⁴¹ reports a case where about 30 grammes ($7\frac{1}{2}$ drachms) of acetanilid were taken with suicidal intent. Among other symptoms were albuminuria and haemoglobinuria. Recovery followed.

Aconite—Aconitine.—William Murrell¹²¹ calls especial attention to the various degrees of strength of the different varieties of aconitine on the market. The division into French, German, and English aconitine is considered by him to be as unreliable as it is unscientific. In fever, L. A. Merrian¹³⁹ advises a combination of aconitine and veratrine, as he considers them synergistic.

Ailanthus.—L. Pike¹⁹² uses the fluid extract of ailanthus in the treatment of spasmodic conditions. The dose given is 15 drops every half hour.

Alcohol.—J. W. Grosvenor¹⁷⁰ writes an interesting article against the use of alcohol in medicine. If alcohol prevents coagulation, the writer considers it certainly wrong to administer alcohol to cases where much haemorrhage is expected. When alcohol is used his preference is for methyl alcohol, as it is absorbed and eliminated more rapidly than ethyl alcohol. In the discussion of the paper, Burghardt remarked that he had seen an attack of apoplexy undoubtedly produced by the use of alcohol. It was the general opinion of those present (J. H. Pryor, Van Peyma, and others) that alcohol should at once be withdrawn from cases of delirium tremens, except in old persons long habituated to its use. The use in medicine of the cheap, pure California wine is recommended in place of the adulterated, high-priced, imported foreign article.¹⁹¹

Angus Mackinnon³⁹ remarks that we pay strict attention to

the purity and dose of our more powerful remedies, but usually prescribe whisky and brandy in a hap-hazard sort of a way. A description is given of the manner in which modern whisky and rum are prepared. The writer's preference is for the new-style whisky, as it does not contain the fusel-oil, ethers, and extractives of the old-style whisky, prepared by distillation. W. P. Ford⁷⁴ lays down the rule that alcohol must not be given in medicine in such large amounts as to give an alcoholic odor to the breath. H. Jerard¹⁰² considers that fermentation is a process of nature, while distillation is not, and that the fermented products are useful, while the distilled are harmful. "A general practitioner"⁶ thinks that the administration of divided daily doses of 8 ounces (256 grammes) of brandy was the cause of a young man dying five days after an operation in which chloroform had been used. After showing the great value of alcohol in lung diseases, fevers, etc., Jules Simon²⁰² cites those cases in which it is contra-indicated. His list includes endocarditis, pericarditis, meningitis, epilepsy, eclampsia, chorea, acute diseases of the skin, and certain chronic forms, as eczema, psoriasis, etc., nodular rheumatism and the gouty diathesis.

Aliments.—V. Budde¹⁶ praises a preparation of albumen-maltose which is much used in the northwestern part of Europe. Its composition, according to F. Stein, is: albuminous matter, 15.06 per cent.; carbohydrates and fats, 29.63 per cent.; maltose, 48.78 per cent.; chlorides and phosphates, 2.73 per cent.; and water, 3.80 per cent. The taste and smell of the albumen-maltose is agreeable, and its combination with iron in the form of ferrum oxide has also been obtained. E. Harnack¹⁰⁹⁵ has obtained a pure albumen from the ash-tree, which differs from ordinary albumen in not being coagulable at 212° F. (100° C.) or in being precipitated by alcohol or ether.

Apples are said by German analysts¹⁵⁹ to contain the largest amount of phosphorus of any of the fruits or vegetables. This food is, therefore, advised for brain-workers. From careful analysis of several specimens of beef-teas used in the diet of certain patients, Arthur P. Luff⁶, has come to the conclusion that the stimulant, tonic, and dietetic properties of beef-tea depend chiefly upon the peptones. He agrees with Hofmeister, Nadine Popoff, and Julia Brinek that the peptones do not simply diffuse through

the walls of the intestines, but are taken up by the mucous membrane and transformed into serum-albumen through the activity of the intestinal cells.

As regards the advantages to be derived from the use of boiled milk over those of fresh milk, there has been some discussion of late.^{21, 20} The chief point at issue is whether boiled milk is as digestible and assimilable as the fresh article. Hübner, some time back, instituted a series of experiments upon sick children, and found that more than one-half of these increased in weight under the use of boiled milk, while the other half either lost weight or remained stationary. No accurate conclusions could be drawn from these results, as the treatment was employed in a variety of diseases, and, besides, no comparison was made with the fresh milk. Raunitz, therefore, worked up the subject upon healthy animals, and his results may be considered more satisfactory. Particular attention was given to the study of the assimilations of nitrogen, fat, and calcium salts, both in the fresh- and the boiled-milk diets. From the tables published it is seen that the assimilation of nitrogen and lime is more complete when the animal is fed upon fresh milk; while in the two diets the assimilation of fats and phosphoric acid is identical. It appears, however, that the results that should be considered as reliable are those of the nitrogen, and the difference in these results are so slight as to be almost unworthy of notice. On the whole, they appear to show that if there is any difference between the nutritive value of fresh and boiled milk, it is so slight that it may be overlooked from a practical point of view, especially when the advantages of sterilized milk are fully considered. With regard to the nutritive value of boiled and unboiled milk, Vasilieff^{24, 673} has made six observations on healthy individuals, and arrives at the following conclusions: 1. The assimilation of the nitrogenous elements in boiled is less perfect than in unboiled milk. 2. The assimilation of fatty matters follows the same rate, even more distinctly so. 3. The quantity of fatty acids which are contained in the faeces is notably greater in those who were fed on raw milk. 4. Consequently the nutritive value of boiled is less than that of unboiled milk. 5. The difference is accounted for by the rapid conversion of the casein of boiled milk into hemialbuminoid. H. E. Desrosiers¹²² thinks that milk is indicated in all those cases where a general tonic is desired.

In order that no repugnance may be formed to this article of diet, it is advised that a small amount be given at first and gradually increased.

Alkaloids.—John A. Cutter¹²¹ cites a case to show that certain alkaloids are so delicate that they are injured if the tablets are dried too quickly. A prescription of his, calling for a tablet of hyoscine, morphine, and atropine, was dried in a half hour instead of a day and a half, as recommended to him by druggists.

Ammonium.—C. Gottbrecht²⁷³, has shown by experiments that a 5- to 8-per-cent. solution of ammonium will preserve rabbit-fat ten months from decomposition. He found that a 5-per-cent. solution of ammonium carbonate also acted as an antiseptic, and that meat, animal organs, etc., being in the fumes of this drug, looked nearly the same after six months. P. Carles¹⁸⁸ describes his personal experience with ammonium hydrate. The mucous membrane of the anterior part of the mouth was denuded, and the peculiar fact is noted that after three days, when solid nourishment was again taken, the food appeared to be saltless.

Amygdalus Persica.—C. C. Edson¹⁹² uses an infusion of the inner peach-bark to allay vomiting, except it be reflex. The advantages claimed over an infusion of the leaves are that it mixes readily with other preparations, is pleasant to the taste and eye, and is more potent. Eight ounces (256 grammes) are macerated with 1 pint (500 grammes) of dilute alcohol, and 5 drops are given every five or ten minutes until the vomiting is checked. I. Albert¹⁹² reports a case of obstinate vomiting in a woman, which was cured by the administration of this remedy after other measures had failed. The vomiting had continued almost uninterruptedly for twelve days, and was ascribed to the excessive use of beef-tea. This food was stopped, and the following mixture given:—

R. Aq. laurocerasi, fʒj (31.1 grammes).
Morphinæ muriatis, gr.j (0.07 gramme).

. M. Sig.: Ten drops on a piece of ice every hour.

The vomiting was checked, and the patient rapidly recovered.

Amylene Hydrate.—W. H. Flint⁸⁰ has found the action of this drug to be similar to that of alcohol. In therapeutic doses it produces sleep by its soporific action upon the cerebrum. Toxic doses paralyze the cord and medulla, finally abolish reflex activity,

arrest respiration, and paralyze the heart. He treated 38 cases of insomnia, with success in 67 per cent. It was used in insomnia resulting from nervousness, excessive mental exertion, anæmia, fevers, insanity, cardiac diseases, and from the withdrawal of narcotics that had been constantly used. The drug appeared to be contra-indicated in insomnia from pain, cough, and frequently in cardiac and uræmic dyspnoea. Its use by the mouth was not tolerated in gastric disorders attended with irritation or nausea, and in such cases its administration by the rectum was followed by the usual beneficial results. Many patients and children did not tolerate it on account of its taste and odor. Generally it was found that the drug could best be administered by the mouth by means of a soft capsule, or a solution disguised by some aromatics. The mixture should be well shaken before use, in order to avoid an overdose. For adults the dose was 30 to 45 grains (2 to 3 grammes) by the mouth, and 40 to 75 grains (2 to 5 grammes) by the rectum. Unusual effects were produced only by large quantities, and consisted in loss of reflexes, paralysis of extremities, mydriasis, low temperature, feeble pulse, and shallow respiration. No cases were observed in which an amylene hydrate habit was engendered, or a cachexia developed, due to the remedy.

Anemone Pulsatilla—Anemonine.—The active principle of anemone pulsatilla is anemonine. This alkaloid, in doses of 0.05 to 0.20 centigramme ($\frac{1}{2}$ to $\frac{2}{3}$ grain) daily, has been successfully used by Bovet,²⁰⁰ of Pougues, in 34 cases of painful affections of the female pelvic organs. Of the above cases 22 were suffering from dysmenorrhœa, and the remaining 12 from metritis, perimetritis, uterine prolapse, and ovariosalpingitis. Even when the cases were of a surgical nature, the anemonine acted as a powerful sedative.

Aniline.—Much has been written on the subject of the various aniline colors during the last year. On account of the great number of these preparations, and from the fact that they are often called after the color they stain tissue, confusion has arisen in regard to their proper nomenclature. We would therefore advise great care in the selection of these preparations for therapeutic use.

On account of the property of methyl blue staining nerve-tissues, especially the axis-cylinder, Ehrlich and Leppmann¹¹⁸ have tried this drug as an analgesic in the treatment of 25 cases of

painful affections. It was used both hypodermatically (dose 1 to 4 centimetres—15 grains to 1 drachm—of a 2-per-cent. solution) and internally by capsules (dose 0.1 to 0.5 and not over 1.0 grammé— $\frac{1}{2}$ to 15 grains—per day). In fifteen minutes the urine was noticed to be light green, in two hours a bluish green, and in four hours a dark blue. The saliva and faeces were also colored, but the conjunctiva, skin, and mucous membrane remained free from color. In two hours from the time of administration the pain usually began to be relieved. E. Vonder Goltz¹⁵⁰ has been much pleased with the use of a 2-per-cent. solution of methyl violet and aniline red in the treatment of various minor surgical operations, gonorrhœa, and blennorrhœa neonatorum. The duration of 2 cases of gonorrhœa was limited to ten days by this treatment. He also suggests the use of anilinum crudum in the proportion of $\frac{1}{40}$ of 1 per cent., a little alcohol being added in order that a solution be formed. One of the advantages claimed for this solution is the fact that it will contain a minimum amount of arsenic in case this metal be at all present. As a disinfectant for instruments its use is advised, as steel is not acted on by the aniline colors. Combemale and François¹⁵¹ have employed methyl blue with success in simple neuralgias, and also in neuritis and the pains of ataxia. The remedy was likewise found of service in acute articular rheumatism and other diseases of the joints. Pain disappeared in two hours after administration. Two decigrammes (3 grains), in pill form, was sufficient to produce the analgesic effect. The employment of the remedy was never followed by any untoward phenomena. Methyl chloride, according to Moissan,^{164 151} produces rapid and complete anaesthesia.

J. Stilling has done much to bring the aniline colors to the notice of the profession. He recommends them on the ground that they are (1) perfectly non-toxic; (2) very diffusible; (3) they do not coagulate albumen, thus forming the single exception to all antiseptics in this respect; and (4) their antiseptic properties are next to the bichloride. He thinks that the remedy has been tried by some in cases where *a priori* one would expect no good results. The preparations used are a 1-per-cent. powder of auramin in mild cases of conjunctival affections, to 2 per cent. of the blue in severe. A powder can also be used as a snuff in inflammations of the mucous membrane of the nose, in burns,

chafing, etc. A salve (2 to 10 per cent.) in blepharitis ciliaris, eczema, etc., and a solution (0.1 to 1), for eye purposes, are recommended. As the solutions become colorless on exposure to light, they should be kept in darkened bottles and be renewed every week. A pencil may also be used in the treatment of various affections of the eye and in minor surgical operations. Jänicke,¹¹⁸ has made a series of bacteriological experiments with methyl violet, and found it to be a good germicide. He finds, however, that when the micro-organisms are in blood-serum, the antiseptic power is not so great, but still powerful enough to act as a good antiseptic. The color tells us that the solution has been brought into absolute contact with every part and is thus an advantage. The experience of Valude and Vaginal¹¹⁹ does not agree with that of Stilling and Jänicke. They found the aniline colors much inferior and weaker than the corrosive sublimate, it taking one hour for a pyoctanin solution of 1 to 100 to produce the same effect that a 1-to-4000 solution of the bichloride would produce in five or six minutes.

Penzoldt,²⁵ from experiments of some fifteen different aniline colors, does not think these substances to be suited to aseptic surgery. After a trial in diphtheria it was found that the disease was not influenced, for the better or worse, by the use of methyl violet and malachite green. The diphtheritic membrane appeared to be less stained than the healthy mucous membrane.

G. Sée and Morau³¹, have found that a solution of 1 to 2500 of safranin and cyanin will destroy the germs of the diphtheritic bacilli and the micrococci pyogenesis, while in the proportion of 1 to 25,000 these cultures flourished after eight days. Notwithstanding the fact that the color disappeared on standing in the light, there was no interference with their antiseptic power.

In a later paper,³¹ these writers continue their experiments under four heads: 1. Physiological experiments to determine the toxic properties of safranin, cyanin, malachite green, and methyl violet. 2. Bacteriological experiments to determine their antiseptic properties. 3. The influence of these colors on artificially-produced suppurations in animals. 4. As to the therapeutic applications permitted by these experiments, their conclusions are that (1) the aniline colors of the aromatic series, deprived of phenyl and arsenic, are non-toxic; (2) they vary in their antiseptic properties,

methyl violet, malachite green, and safranin being the most powerful and cyanin possessing but slight antiseptic power; (3) in the strength of 1 to 2500 they favorably modify suppuration and are able even to prevent it; (4) it would be proper to apply to man what we have learned from experiment on animals. For several years past Kremianski,⁶ has advocated the antiseptic powers of the aniline colors in the treatment of consumption. V. Gretchinsky,^{571, 673} gives tincture of digitalis after ol. anilini in order to counteract the cyanosis which may follow its use. Paul Noguès,⁸¹ a pupil of Panas, finds that a solution of 1 to 2000 of methyl violet is always well tolerated in eye affections, and that very often the strength can be increased to 1 to 1000 without any signs of irritation. The writer thinks that these solutions fulfill the conditions of a good antiseptic in suppurations of the conjunctiva and in all the inflammatory affections of the cornea. Braunschweig,¹¹⁸ has found that, while no harmful effect was noticed from the use of the aniline colors in the eye; still, at times, there was a burning sensation produced, which was so intense that on several occasions it had to be allayed by the use of cocaine. In certain cases in which auramin was used, yellow vision was produced, which lasted as long as a half-hour. Carl⁸⁰ has not succeeded in obtaining good results with aniline in the treatment of diseases of the eye. A case of serpiginous ulceration of the cornea seemed to be aggravated by the use of methyl violet. After the application of chromic acid or the cautery, in 18 cases of nasal trouble, Bresgen¹¹⁸ has found pyoctanin very useful in preventing inflammation and the formation of pus.

O. W. Petersen,⁸⁴⁴ has used pyoctanin (a pure form of methyl violet) in the treatment of 48 cases, mostly of a syphilitic character. In 20 cases of moist chancre, by touching the part with the solid stick, the results were especially favorable. Oskar Liebreich⁸⁴⁴ calls attention to the fact that pyoctanin is not a definite chemical compound, and, therefore, care must be taken as to the sources from which it is obtained. This may explain the unfavorable results recorded by certain observers. Z. Krówczynski,⁸⁴⁴ has used this drug in the treatment of gonorrhœa, herpes progenitalis, and lupus. In gonorrhœa the application of 1-200 to 1-100 was successful. In lupus the results were not so good as with iodoform.

Annidalin.—Messinger and Nortmann,²⁴ describe a tri-iodide of dithymol, and suggest its use in place of iodoform and aristol. The powder is of a reddish-brown color, decomposed by light and heat, with the evolution of iodine, readily soluble in chloroform and ether, slightly so in alcohol, and insoluble in water. Aristol has also been called annidalin, and it would be wise not to confuse these two compounds.

Antifebrin.—See Acetanilid.

Antimony.—Laurie²⁰⁸ advises the now almost-forgotten use of small but frequently repeated doses of antimony in arresting inflammation.

Antipyrin.—But little new work has been done on antipyrin and antifebrin during the last year. Since their first appearance these drugs have probably been given in almost every described disease. That such powerful agents should have been used in such large doses, and so recklessly, should be a warning to those experimenting with some of the newer drugs.

Behal and Choay,¹⁷ are stated to have shown that there are two combinations of chloral and antipyrin. In the first case one molecule of chloral unites with one of antipyrin, and we have octahedral crystals formed. In the second case two molecules of chloral take only one of the antipyrin, and the crystals thus produced are prismatic. J. Millard and A. Campbell Stark,²⁰⁹ give some of the different ways in which antipyrin will act with other medicaments. Among others are mentioned that crystals of salicylate of sodium will liquefy, and that a reduction will immediately take place with the permanganate of potassium. J. Seeligmann¹¹⁶ dulls the pains of labor by a clyster of 2 grammes (30 grains) of antipyrin, or by the hypodermatic use of 1 to 3 grammes (15 to 45 grains) of a 50-per-cent. solution. The crystals first described by Blainville, occurring when chloral hydrate and antipyrin are rubbed up together, have been studied by L. Reuter.²⁰⁸ He finds them to be chemically trichloraldehydphenyldimethylpyrazol, and, in experiments made on rabbits, to be totally inert. If this should prove to be a fact, the administration of antipyrin in chloral poisoning might be of benefit. Jno. P. Stewart, of Alabama,⁶⁴⁷ has found antipyrin of the greatest use in typhoid malaria and malarial fevers, a most beneficial effect being observed on the headaches. His experience covers 239 cases. From 3 cases of his own, W.

D. Hamaker,⁸⁰ wisely draws the conclusion that we should commence with a small dose of antipyrin, and should not increase it until we feel confident that the patient is not susceptible to its use. Jean Bouisson^{1096; 211}, has made experiments with antipyrin in pertussis, chorea, and enuresis. In the first-named disease, with two exceptions, his results were negative or contradictory. In 19 cases of chorea, 11 were completely cured, 6 improved, and 2 exceptionally bad cases slightly ameliorated. The best success was in the treatment of enuresis, as here the 8 cases were completely cured by the use of 2 to 4 grammes (30 to 60 grains) in the twenty-four hours, according to the age of the patient.

R. Roscioli,⁷⁵ has used very large doses of antipyrin as a sedative in the treatment of the insane. The dose given was from 3 even up to 7 grammes (45 to 105 grains). The only favorable results noted were in the case of epileptics, where the attacks were either lessened or stopped by its use. It was found, however, that the benefit was only temporary, and that when the antipyrin was withdrawn the attacks returned. Misrachi²⁵ asserts, as the result of his investigations with antipyrin in obstetrical and gynæcological cases, that this drug possesses great value in dysmenorrhœa, except where the secretions are scanty, and in relieving the after-pain of labor. From 21 obstetrical cases this author was only able to obtain anæsthetic properties in 6, but good results were obtained in over 80 per cent. of the cases in which the after-pains were severe. S. Henry Dessau⁵¹ has found great benefit from the use of antipyrin in 7 cases of chorea and 45 cases of pertussis. Chronic urticaria is also stated as readily yielding to this treatment. The druggists have quickly learned the value but not the dangers of the use of antipyrin. A druggist was recently censured by the coroner and his jury for giving four powders of 12 grains (0.8 gramme) each to a servant, though, on a post-mortem examination, she was found to have died from a tumor in the brain. The box from which the antipyrin was taken contained the printed instructions that antipyrin is to be taken upon prescription and under medical care. Schwabe,⁴¹ reports a case of acute antipyrin poisoning from a single dose of 1 gramme (15 grains). Besides the usual symptoms, there was complete amaurosis, which lasted fully half an hour and then gradually began to disappear. The ophthalmoscopic examination only revealed

a marked hyperæmia of the optic nerve, with slight obliteration of the disk. D. C. Lewis¹⁹⁹ states that a 15-grain (1 gramm) dose of antipyrin produced in himself itching, urticaria, severe colicky pains, puffed hands, eyelids and ears, and indistinct hearing. Julius L. Salinger⁵, reports a case of antipyrin poisoning in which there were formed whitish-yellow membranes on the tongue, lips, and pharynx, symptoms of laryngismus stridulus, multiple abscesses, urticaria, etc. These symptoms were produced at three different times, the dose of the antipyrin being, in the two first attacks, but 5 grains (0.33 gramm). E. W. Young⁵⁰ has found 6 grains (0.40 gramm) of antipyrin to produce pains and an urticarial eruption with much itching in a robust adult.

Antisepsin.—Cattani⁵⁵ has found that $7\frac{1}{2}$ grains (0.50 gramm) of paramonobromacetanilid (antisepsin) will reduce the temperature from 2 to 3° C. (3.6 to 5.4° F.) in cases of phthisis, typhoid fever, and pneumonia. Cyanosis, however, follows, and the hæmoglobin is converted into methæmoglobin. This writer also finds that it possesses analgesic and antiseptic properties to a marked degree. When applied to wounds the pain is lessened and cicatrization hastened. A suppository of antisepsin, used night and morning, was found useful in the treatment of piles. The dose of antisepsin here given is but $\frac{1}{2}$ grain (0.05 gramm) four times a day.⁶.

Aristol.—It does not take so long as formerly to discover the value of a drug. Experimenters, in all parts of the world, are now ready and anxious to leave the old and try the new. It is rarely, however, that a drug has so rapidly risen into popular favor and its therapeutic uses so well established as in the case of aristol. This drug is described by the manufacturers as being a substitution compound from two molecules of thymol, $C_{10}H_{18}HO$, in which the two hydroxyl radicals (HO) have been replaced by two iodoxyl radicals (IO). Its chemical name is dithymol-diodide, and the amount of iodine contained in this compound is 45.8 per cent. The crystals are of a light, reddish-brown color, odorless, insoluble in water, slightly so in alcohol, and very soluble in ether and fats. Heat and light have a deleterious effect upon it. Ed. Egasse⁶⁷ writes that the word "aristol" is derived from the Greek $\alpha\rhoιστος$, meaning "better," and that a former name of this compound was annidalin: Louis Boulé³⁶² gives the following directions for its

rapid and economical production. Five grammes ($1\frac{1}{2}$ drachms) each of crystallized thymol and caustic soda and 5.8 grammes (1 drachm 37 grains) of potassium iodide are gently heated with enough distilled water to make 50 cubic centimetres (1 ounce $4\frac{1}{2}$ drachms), and then cooled. The resulting solution is then added to 250 cubic centimetres (7 ounces $6\frac{1}{2}$ drachms) of a concentrated solution of the hypochlorite of soda, and vigorously agitated for fifteen minutes. The solution is then to be filtered and the precipitate washed with water and dried away from the light. Quinquaud and Fournioux¹⁶⁴, have found a method which will at all times produce an identical power of the composition of aristol:—

SOLUTION A.

Scales of iodine,	.	.	.	.	60 grammes (2 ounces).
Potassium iodide,	.	.	.	.	30 grammes (1 ounce).
Distilled water,	.	.	.	.	{ enough to make 300 cubic centimetres (9½ ounces).

SOLUTION B.

Solution B is poured into solution A, carefully agitating at a temperature of from 15° to 20° C. (59° to 68° F.). The solution is then filtered, and the crystals washed with cold distilled water and dried between several thicknesses of filtered paper; to be kept in dark bottles. These writers find aristol of great value in causing rapid cicatrization. In dose of 2.5 grammes ($37\frac{1}{2}$ grains) per kilo-weight of guinea-pigs and dogs there was no toxic action discernible. In regard to its elimination by the urine, it appears to be in the form of an alkaline iodide, and, probably, also thymol. When administered hypodermatically no local inflammatory symptoms were noted.

Aristol was sent by the manufacturers of the drug to P. J. Eichhoff²⁸ to determine its value. From its use in varicose ulcers, lupus, eczema, psoriasis, scabies, herpes tonsurans, and syphilitic lesions, he draws the conclusion that we have in aristol a valuable non-toxic, odorless remedy, of the greatest use in the several varieties of skin diseases. Special benefit was obtained in the treatment of varicose ulcers.

A. Neisser,⁴ while not sanguine as to the great value placed

upon aristol by Eichhoff, has confirmed his experiments that when aristol is introduced into the system it is without toxic effect, and that potassium iodide and iodic acid are absent from the urine. It was found impossible to destroy cultures of the various cocci and bacilli by the application of aristol alone. If, however, a 10-percent. ethereal solution was used and the ether allowed to evaporate, the aristol seemed to encapsulate the germs and thus hinder their growth. If the germs thus encapsulated were again dissolved in ether and the liquid poured off, it was found that cultures of the sporogenous anthrax and the staphylococcus could be produced. In 13 cases of lupus the aristol was found to have an effect only when the nodules had been previously curetted. In only 2 out of 12 cases of psoriasis could it be said that a cure was effected by the use of aristol, but it was found that chrysarobin acted much more promptly on the patches which had been previously treated with aristol. Hughes, of Soden-Würzburg,¹⁰ under the advice of Seifert, was one of the earliest experimenters to follow Eichhoff. This writer used aristol in 44 cases in the treatment of inflammations of the mucous membrane of the nose, larynx, and pharynx. It was found that the powder could be blown through the finest tubes, and, as thus applied, was found to adhere to the surface of the remotest parts. Sneezing or other unpleasant symptoms were not produced by its use. In one case where aristol was used daily the urine did not show a trace of iodine, according to Castain's test. On account of the property of aristol to increase secretion, it was not used, after a trial in 11 cases, in the treatment of rhinitis acuta or in other cases where there was much secretion. In all forms of chronic rhinitis in which the secretions were diminished or absent, the treatment by aristol was more or less successful. In 9 cases of rhinitis sicca, even when complicated by pharyngitis sicca, the results were good. In 3 cases of rhinitis atrophicans simplex, 6 of rhinitis atrophica foetida, 2 cases of specific ozæna, with perforation of the septum cartilaginum, and 7 cases of laryngitis, the remedy worked well. From 3 cases of nasal tuberculosis and 4 of laryngeal syphilis, Hughes thinks that further investigation should be made before judging of the value of aristol in these affections. Seifert⁸,_{n.s.} agrees with Eichhoff and Schirren that the external application of aristol is followed by favorable results. In 6 cases of ulcera cruris e varicibus, a 10-per-

cent. salve quickly caused the ulcerative surface to granulate and heal, without the aid of any other medicament. The salve was applied two or three times daily. In only 1 out of 4 cases of lupus exulcerans was much progress made by the use of a 5-per-cent. salve. Moist condylomata on the genitals of 6 syphilitic women were almost dried up in three days by the use of the powder dusted on their surface. Other syphilitic growths in various parts of the body did well by this treatment. F. Goldmann¹⁵⁰ states that Willgeroch and Kornblum⁹⁰² were the first to obtain the monoiodidethymol, and that Messinger and Vormann isolated the dithmyol-di-iodide. The difference between these two compounds is that the mono contains the iodine in the nucleus of the compound, whereas in the di-iodide it is in combination as an iodoxyl.

In France, Brocq¹⁶⁴ was the first to call attention to aristol. He found that cicatrization was quickly produced in an ulcerated superficial epithelioma, extending from the angle of the mouth to the orbit, the lower lid being entirely obliterated. Schmitt,¹⁸⁴ after using aristol in 40 cases, agrees with the published record of Neisser, that too much value has been ascribed to this drug. In 10 cases of moist chancres the lesion grew worse under the use of aristol. In the treatment of an epithelioma he was not successful, as was Brocq, and had to resort to surgical means. The results of 7 cases of varicose ulcers were good. The patients had had absolute rest in bed and applications of carbolic acid, iodoform, and creolin, without avail. In 2 cases of psoriasis as favorable results were produced as with chrysarobin. Schirren¹⁸⁴ has used aristol in 10 cases of psoriasis, and found that the scales rapidly disappeared without the aid of any other medicament. His success in the treatment of lupus was not so successful as in those cases quoted by Eichhoff.⁴ A 10-per-cent. ointment was used.

Rohrer¹¹³ has found the drug very serviceable in the treatment of 20 cases of suppurative otitis. The cavity is first thoroughly cleansed and insufflations of aristol practiced. In the treatment of gynæcological cases Sweiciki⁸⁴ used the following formulæ:—

R Aristol.,	5.0
Pulv. gummi Arab.,	q.s.u.f.
Bacilli no. v longit. cm. v.	
R Aristol.,	0.50-1.0
Butyr. cacao, q.s.u.f. suppos. ev. boli vagin. d. tal. dos. no. x.	

These were found serviceable in endometritis, erosions, hyperplasia cervicis, parametritis, and eczema vulvæ. No unpleasant symptoms were produced, though large quantities were used. Iodine could not be found in either the urine or the saliva.

Armeria Vulgaris.—Brunner, of Buda-Pesth,¹⁶⁰ has successfully employed an infusion of the maiden-pink as a solvent for renal and vesical calculi and for catarrhal troubles of the genito-urinary organs.

Arsenic.—A. V. Gosweiler¹⁰⁴ discussed the history and the therapeutic value of arsenic. George H. Rohé remarked, after the reading of this paper at the Medical and Surgical Society of Baltimore, that the nausea found in those persons taking Fowler's solution was in most cases due to the compound spirits of lavender contained in the preparation. Paschkis⁸¹ has found that arsenic suspended in oil or vaseline is absorbed when applied either under or when rubbed on the skin. The arsenic was found in both the urine and faeces. Charles A. Cameron² reports the probable death of a woman aged 53 suffering with cancer from the application of an arsenical plaster to the breast. A positive case is also recorded as occurring in 1883, where an arsenical plaster applied to a tumor caused death. A. M. Pierce¹⁴⁴ reports that 2 tablespoonfuls of Paris green did not bring on an abortion in a woman in the sixth month of pregnancy.

Arsenite of Copper.—John Aulde¹⁷⁶ continues to extol the use of arsenite of copper in the early stages of bowel complaints. The dose prescribed by him is 0.005 grain (0.000185 grammes), frequently repeated. D. H. Lake,¹⁴⁴ J. F. Escher,¹⁷⁶ and M. F. Dumas¹⁷⁶ add their testimony to that of Aulde in the treatment of bowel troubles by means of this drug.

Atropine.—See Belladonna.

Belladonna.—There is a plant called the *Scopolia carniolica*, which grows wild in the Carpathian mountains of Austria-Hungary. According to Dyce Duckworth,² who has completed some investigations begun by T. Lauder Brunton, this drug possesses properties differing but little from those of belladonna. Dryness

of the mouth does not follow its administration, though perspiration can be checked, pain relieved, and the circulation increased by its use. The local use of belladonna in arresting and preventing mammary abscesses resulting from an abnormal lacteal secretion has been successfully tried by M. W. Leavitt.¹⁸⁸ He reports 3 typical cases to show that he has never failed in these instances to obtain the desired effects. His method of application is as follows: A piece of belladonna plaster is cut of sufficient size to cover the breast, leaving a hole in the centre, about an inch in diameter, for the nipple. The drug, thus employed, never produces untoward results. The author, however, warns against the use of the remedy during the period of *allaitement maternel*, as the absorption of the drug may prove injurious to the child. John V. Shoemaker and John Aulde¹²¹ give the article on belladonna from their new Therapeutics. The manifold uses of this drug are well described. F. W. Richardson¹⁰⁵ gives an interesting personal account of his symptoms after taking a dose of atropine by mistake. During the delirium the time was spent in running about the room and falling down, seeing pictures of animals on the walls, and holding a conversation with imaginary faces. Twenty-four hours later he found himself nearly as well as usual. In describing this case at the Ramsey County Medical Society, C. Williams said that he had recently seen a case where a 1-per-cent. solution applied to the eye caused delirium; and J. Ohage related that the hypodermatic use of $\frac{1}{4}$ grain of atropine had caused death. William McGowan² saw a patient who had taken by mistake a tablespoonful of the linimentum belladonnæ (B. P.). She presented all the symptoms of approaching death, and it is the opinion of the writer that she was restored to life by the use of pilocarpine. Two doses of $\frac{1}{4}$ grain (0.02 gramme) each were given hypodermatically. Rose² relates that a child, aged 2½ years, suffering from atropine poisoning, was quieted by the use of three $\frac{1}{10}$ -grain (0.0065 gramme) doses of pilocarpine hypodermatically administered within the space of one hour. This amount did not cause sweating. E. B. Sangree⁷⁶⁰ reports an interesting case of idiosyncrasy against belladonna in a girl 10 years of age. The instillation in the eyes of 2 drops of a solution of the sulphate of atropia, which contained $\frac{1}{90}$ grain (0.00075 gramme) only, was followed in the course of ten minutes by the usual symptoms of bella-

donna poisoning,—smothering sensation, dryness of the throat, headache, dizziness, numbness of the hands and feet, a sensation of swollen hands, a red followed by a purple color of the face, and general weakness. The symptoms, however, gradually became less marked, and in five hours they entirely disappeared.

T. N. Kelynack,²¹ reports that a girl aged 10 suffered from quite severe symptoms of poisoning from the use of atropine drops. One drop of the liquor atropinæ had been used during two weeks, three times a day, in the left eye for an attack of keratitis. James Cantlie,²² reports the poisoning of a man by the use of the sulphate of atropia, used to prepare a tooth for plugging. A quick recovery followed. E. R. Axtell,¹ was called in to treat a woman who had taken nine $\frac{1}{8}$ -grain (0.008 gramme) morphia pills. Three-quarters of an hour afterward, through a mistake, $\frac{2}{3}$ grain (0.021 gramme) of atropine was administered hypodermatically. The symptoms of atropine poisoning were more manifest than those of morphia. A complete recovery followed.

Bilirubin.—In a recent thesis, G. de Bruin¹, arrived at the conclusion that this substance is a poison to the organism, confirming the statement of Bouchard, and that it has properties more toxic than the other biliary constituents. Bilirubin is a poison to the frog's heart and probably also to that of the mammalian. It occasions disorders of the renal parenchyma, and acts also as a poison to the central nervous system.

Bismuth.—It is claimed that the garlicky odor sometimes produced in the breath of patients taking the salts of bismuth is due to the presence of the metal, tellurium. This fact was first noticed by Sir James Simpson, and was established further in 1875, when specimens of bismuth containing tellurium as an impurity invariably produced in the breath the peculiar odor referred to. Recently the British Pharmacopœia has established a rule to give a special test for the detection of the metal, and thus guard against the impurity.

Blatta Orientalis.—Joseph Drzewiecki, corresponding editor at Warsaw, in a communication to the ANNUAL, affirms that he has obtained excellent results in the use of black beetles (cockroaches) as a diuretic. He has used the remedy during four years of hospital practice. From his own observations he has arrived at the following conclusions: that it is an excellent diuretic, espe-

cially in cardiac dropsy; that even in doses of 0.3 grammie ($\frac{1}{2}$ grain) it has no untoward effects on the heart, stomach, or bowels, and that it is, therefore, preferable to calomel; that its diuretic effects appear after a few hours and are lasting; that it produces a constant diminution of the albumen; that it may be employed for diagnostic purposes, as it exercises no influence in cases of cardiac dropsy complicated with cirrhosis of the liver; that it is effective in inflammation of the kidneys of the subacute type; and, lastly, that the remedy has no effect in the chronic stages of the disease.

Boric Acid—Boracic Acid.—It is well known that boracic acid is only soluble to the extent of a little less than 4 per cent. It is stated²²⁸ that 1.25 parts of calcined magnesia will increase the solubility of 10 parts of boracic acid to such an extent that a 12-per-cent. solution can be prepared by the aid of heat, and that a solution so prepared will not crystallize in the cold. Bertrand² uses with success an 8-per-cent. solution of glycerin and boric acid in the treatment of the pustules of small-pox. Lemoine¹⁵¹ relates 3 cases in which boric acid in large doses gave rise to symptoms of poisoning. There was an eruption, vomiting, headache, insomnia, and mild delirium. There was no rise in the temperature or increase in the frequency of the pulse.

Bromides.—Ernst¹¹⁶ shows that the continued use of potassium and sodium bromide delays the appearance of the menses. The daily use of 2 to 3 grammes (30 to 45 grains) of the bromide in normally menstruating epileptics retarded the flow from eight to twelve days. The bromide being stopped, the menses returned to their former regularity. Doyon³⁰² has recently made a chemical examination of the brain and liver of an epileptic who had been subjected to large doses of the bromides. He found in the brain 1.934 grammes (30 grains) of the potassium bromide, and 0.73 grammie (11 grains) of the same salt in the liver. From this result he infers that the salt localizes itself in the brain, but he does not believe that the drug produces a toxic action during life. According to W. Petit,⁷⁸ bromide of potassium should be given in small doses at the beginning, in order to avoid gastric troubles and other unusual effects. Not more than 20 to 30 grains (1.3 to 2 grammes) should be given daily, increasing this amount by 10 grains (0.6 grammie) every two or three weeks. One and a half to

2 drachms (6 to 8 grammes) should not be reached in less than six months. This method appears to give better results in the treatment of neuroses, especially epilepsy. J. Samper⁸¹⁷ maintains the view that the drug possesses antidotal powers against iodoform poisoning, and reports a case of iodism produced by iodoform dressings, which was remarkably improved by the administration of potassium bromide. He attributes the favorable effects to the action of the bromide on the free iodine, being preferable to the potassium bicarbonate, sodium chloride, or potassium acetate. The author finally states that the potassium bromide may be used as a preventive of iodine poisoning.

Butyl Chloral Hydrate.—H. A. Hare⁵⁹ reports a case of neuralgia and insomnia, due to middle-ear disease, in which the drug produced decided benefit. Five grains (0.33 gramme) in pills every two hours were administered until 30 grains (2 grammes) had been taken; this amount was followed by total relief. Hare found it valuable also in insomnia of heart disease and in insomnia with head pain, and particularly where branches of the trifacial were affected.

Caffeine, Caffeone, Coffee.—Germain Sée, in collaboration with Lapicque,¹⁰ find that, in small doses, the alkaloid facilitates muscular labor by increasing the activity not of the muscle itself, but of the corresponding cerebro-spinal centre. As a consequence of this double action on the cerebrum and medulla, the sensation of effort is diminished and keeps off fatigue. The drug further prevents loss of breath and palpitation due to severe muscular effort. It does not check tissue waste. Caffeine allows more exertion through a kind of physiological economy. The drug would seem to place an individual untrained in the position of one who had been subjected to perfect physical training. The ingestion of food allows of a certain amount of exertion, but fatigue comes on before the assimilated products of digestion are used up, and thus a reserve is left. Caffeine seems to use up more or less of that reserve, and hence the drug is beneficial only temporarily. The alkaloid would naturally produce deleterious effects when, under prolonged use, there is a lack of fresh food to make up for tissue waste and supply more reserves. A *résumé* of these studies is given in the following conclusions: 1. Caffeine, in small doses, repeatedly given to soldiers on the march (0.60 gramme—

9 grains—per day), facilitates muscular work not by increasing directly the activity of the muscle itself, but by influencing the cerebrum and the cerebro-spinal system. 2. As a consequence of severe effort, shortness of breath and palpitation are prevented by caffeine. 3. Under the use of the drug, persons subjected to prolonged violent exertion acquire the characteristics of individuals in perfect physical training. 4. In producing this excitation of the cerebro-spinal motor system, on which the increase of muscular tonicity depends, caffeine increases the loss of carbon by the organism, but it does not restrain the loss of nitrogen. It does not, in reality, save tissue waste. 5. A means of preventing tissue waste, and so preventing the effects of inanition from fasting, is absolutely impossible of realization, since such a condition could only be attained by absolute inaction or immobility,—a state of affairs which, it is hardly necessary to say, cannot exist. With caffeine, then, the direct opposite ensues; that is, although there is intense work rendered possible, it is only obtained at the expense of the organism. The animal mechanism can only operate at the expense of tissue combustion, and it is precisely in facilitating this combustion that caffeine enables muscular work, even during fasting. 6. Caffeine has, therefore, not the property of replacing food-stuffs, but only replaces the general tonic excitation which the general ingestion of food produces. If one could assume that it was the direct, immediate, instantaneous action of foods which stimulated the stomach and the nervous system, and that their alimentary value did not extend beyond this, they could be substituted by stimulants. 7. The action of caffeine on the heart and blood-vessels is different from what is generally maintained, and is a much more active stimulant than is generally believed.

Edward T. Reichert⁹, reviews the literature on the action of the empyreumatic oil of coffee, or caffeone, so-called. From the results obtained in a series of experiments, the author has shown that the effects observed by the previous investigations of Hare and Marshall were mechanically produced through the presence of an insoluble oil in the blood. Reichert found that olive-oil produced similar results, while the subcutaneous injections of the oil of coffee, as used by Hare and Marshall, were followed by absolutely negative results. The same investigator prepared a distillate from freshly-roasted coffee by means of boiling. The

distillate was of a pale-yellow color, slightly turbid, bitter, and had the strong aromatic odor of roasted coffee. One hundred and five cubic centimetres (3 ounces $4\frac{1}{2}$ drachms) of this distillate injected into the jugular vein of a dog weighing 6 kilos, in doses of 10 cubic centimetres ($2\frac{1}{2}$ drachms), produced, within ten minutes, no definite effects on arterial pressure, pulse, respiration, bodily temperature, or otherwise. The distillate was prepared from different samples of coffee, but the results obtained were the same. This hypothetical principle is apparently more volatile in some samples of coffee than in others, but, whatever its nature, it is not, according to the author, clearly identical with the empyreumatic oil of coffee. From a series of experiments recently made in the Berlin Institute of Hygiene, Lüderitz ²⁸ has shown that the infusion of coffee possesses very decided antiseptic properties. The growth of several different forms of bacteria was interfered with by the addition of a small quantity of coffee infusion. The bacteria were rapidly destroyed in pure infusion. To what constituents this antiseptic action is due has not as yet been determined. Of great importance are the substances which are formed in the process of roasting. A cup of coffee left in a room remains free from bacteria for a week or more.

Calcium Iodate.—W. Dunnet Spanton ²⁹, finds that this salt gives excellent results in some cases of chronic cystitis, when used to wash out the bladder. In such cases the internal administration of the drug also produced good results in clearing the urine and greatly diminishing the fætor of this secretion. It was also found useful as an antiseptic in wounds of all kinds; but in surgical application the iodate of calcium presented two chief drawbacks, insolubility and slowness of action. The iodate of lithium is suggested by the author in the treatment of uric-acid diathesis.

Calcium Sulphide.—According to John Aulde, ³⁰ calcium sulphide is one of the best local antiseptics, in connection at the same time with its internal administration. Boils or carbuncles, treated in the early stages, and especially before the formation of pus, are often aborted by the use of this drug. When the disease, however, is established, its malignant character can be overcome by calcium sulphide, and the suppuration largely checked. Suppuration is also frequently prevented in case of felonies by the timely use of this drug. If the pain is severe, clay and water may

be applied locally, and in such instances sedatives may also be employed. The remedy has also been found useful in the treatment of ovarian and uterine affections, of toothache and earache, especially when suppuration is threatened. Good results were likewise obtained in the treatment of croup and bronchitis.

Calendula.—H. W. Jewett¹⁸⁶ has obtained satisfactory results with this drug in the local treatment of varicose ulcers, and asserts that it causes union by first intention. He has used it internally in teaspoonful doses in cases of blood-poisoning.

Camphoric Acid.—The therapeutic uses of this new substance have been studied at the Royal University Hospital at Greifswald, in the clinic of Mosler. An interesting report is furnished by Bernhard Hartleib.¹¹³ The drug was used in three classes of diseases,—acute and chronic catarrhal affections of the respiratory mucous membrane, acute and chronic cystitis, and the night-sweats of phthisis. Ordinary sore throat (angina) and catarrhal pharyngitis were much improved by gargles of $\frac{1}{2}$ - to 1-per-cent. solution. Excellent results were also observed in 14 cases of laryngitis. In these instances the remedy was applied by means of a brush or in the form of a spray. By inhalations of a solution of the strength of from 1 to 4 per cent. 18 cases of chronic bronchitis and tuberculosis of the lungs were treated, with but little satisfactory results. Gratifying results were obtained, however, in the treatment of cystitis. The drug was tried in 5 cases of an acute and 5 of a chronic nature. Of the first, 4 made a complete recovery; of the chronic ones, 3 recovered in six weeks, in one the final results were not fully ascertained, and the fifth, a very obstinate one of four years' standing, was much improved, but had a relapse ten days after the medication was suspended. According to the writer, the best method of using the drug in these cases is to wash out the bladder twice a day with a one-half of 1-per-cent. solution and then leaving an ounce or two (32 to 64 grammes) inside when the catheter is withdrawn. The strength of the solution may be increased in the course of time. If, as well as cystitis, pyelitis is present, the drug may also be employed by the mouth at the same time. If the bladder be irritable the local treatment should be suspended; but the administration by the mouth of 8 grains (0.52 gramme) three times a day should be continued. In the treatment of night-sweats the doses given were

usually from 15 to 30 grains (1 to 2 grammes) at bed-time. In 12 out of 13 patients the night-sweats were stopped. The thirteenth, a phthisical patient with extensive tubercular disease of bone, received no benefit from the usual amount of 15 grains (1 gramme) given for several consecutive nights. The untoward effects produced by the drug were not many. Fifteen grains (1 gramme) produced severe pain in the region of the kidneys in one case. One phthisical patient vomited a dose of 30 grains (2 grammes), and the local application of the drug in cystitis produced slight swelling of the glans in 2 patients,—a condition that soon subsided. The continued use of the drug in proper quantities did not appear to produce deleterious effects upon the stomach or intestine. M. Warman,^{520 28} considers the acid a powerful and innocuous antiseptic remedy, especially in cases of gonorrhœa, cystitis, and diphtheria. Five cases of gonorrhœa of two months' standing are described as cured by the internal administration of camphoric acid, in from two to four days, in doses varying from 0.5 to 1 gramme ($7\frac{1}{2}$ to 15 grains) three times a day. Two cases of faacial diphtheria, occurring in a woman 24 and a child 3 years of age, respectively, are also reported to have been cured in seven and five days. In these instances a 20-per-cent. solution of the remedy was painted on the affected part, and, at the same time, gargles of the strength of 1-per-cent. were used. The remedy was usually well borne by patients, but prolonged administration produced lumbar and renal pain. Two grammes ($\frac{1}{2}$ drachm) produced in one case gastric irritation and vomiting. Heinrich Dreesmann,²² holds that the activity of camphoric acid as an antihydrotic is only valuable in cases of phthisis and tuberculosis, because, when sweating was produced in animals and men by hypodermatic injections of pilocarpine, the acid was powerless to counteract the action of the alkaloid. Dreesmann could check the sweating of tuberculosis, where the ptomaine which appears to be the cause of the abnormal condition is neutralized by the camphor, through a local action of this drug. In such cases a dose of 1 gramme (15 grains) should be given, although as large quantities as 3 grammes (45 grains) can be administered.

Cannabis Indica.—Germain Sée,⁶⁷ communicated to the Académie de Médecine a very important paper on the uses of cannabis Indica in the treatment of neuroses and gastric dyspepsia.

The author has especially studied the therapeutic properties of the fatty extract, which is prepared by dissolving by heat in butter; that is to say, the alcoholic extract made with pure alcohol at 90° and washed with ether. Contrary to the general idea, Indian hemp possesses no somniferous properties. It has a sedative action on the pneumogastric nerves. The writer has established the indications for the fatty extract in diseases of the stomach. He thus recalls the significance of hyperchlorhydria, organic hyperacidity, and anachlorhydria. Hydrochloric acid, he insists, plays an important part in digestion, as without it pepsin is inert. The acid not only digests, but controls abnormal fermentation. It was in the conditions indicated that hemp, in the form of the fatty extract, and in doses of 0.05 gramme ($\frac{1}{4}$ grain) three times a day was chiefly employed. The drug allayed the painful sensations of dyspepsia and improved the appetite. It had no action on atony or dilatation of the stomach, but it proved of great service in aiding stomachic digestion in cases of hyperchlorhydria. In cases of anachlorhydria the drug acted feebly. Intestinal digestion was improved under the calmative properties of hemp; amelioration was noticed in cases of marked vertigo, in insomnia, in palpitation, and in dyspnœa; but it exercised no great influence in the nervous conditions of hypochondria, hysteria, and neurasthenia, which, of course, differ from those present in troubles of the stomach of a chemical or nervous origin. On the whole, cannabis Indica is considered by Sée as the true sedative of the stomach, as it lacks the disadvantages exhibited by opium, bismuth, potassium bromide, and antipyrin. The drug, however, requires the aid of other remedies, such as the alkalies and certain purgatives. From a contribution to the study of the therapeutic uses of Indian hemp, J. Russell Reynolds⁶ draws some important conclusions. The best results obtained from the use of the drug are those observed in the treatment of mental disorders, as, for example, in cases of senile insomnia, with wandering. In such cases a moderate dose of the drug at bed-time produces excellent effects. Cannabis Indica was found serviceable in melancholia by converting depression into exaltation. It was found useful in the night restlessness of general paresis, but useless in any form of mania. In painful affections, such as neuralgia, migraine, and neuritis, even when the affection is of long standing, hemp is considered by

the author by far the most useful of drugs. It relieved the lightning pains of ataxia, but proved of no value in the treatment of sciatica, myodynia, gastrodynia, enteralgia, tinnitus aurium, muscæ volitantes, and all other kinds of so-called hysterical pain. The drug also relieved the tingling, formication, numbness, and paræsthesia of gouty subjects. It was valuable in clonic spasm, and in convulsions of children, from teething or worms, it effected excellent results by itself. When the bromides or other drugs failed to relieve epileptoid convulsions in adults, hemp rendered great service, but was of no use in true epilepsy; nor did it produce any good results in tonic spasms, such as torticollis, writers' cramp, general chorea, paralysis agitans, trismus, tetanus, or the jerky movements of spinal sclerosis. It was valuable in some cases of spasmodic asthma and in simple spasmodic dysmenorrhœa. With regard to dosage, Reynolds maintains that the proper amount for an adult is $\frac{1}{2}$ grain (0.013 gramme) every four or six hours, which may be increased according to indications. The initial dose for children should be $\frac{1}{10}$ grain (0.0065 gramme).

Nestor Tirard,⁶ reports the case of a man, 48 years of age, who took about 50 minims (3.24 grammes) of the tincture of hemp, and presented, shortly afterward, the following symptoms: Giddiness, faintness, palpitation, and great anxiety, followed by deep sleep. After the symptoms had subsided the patient complained of great hunger. The same patient continued afterward in taking the drug in the ordinary doses, for the relief of migraine, and no untoward effects were noticed.

A communication⁶ describes the effects following the ingestion of 40 drops of the tincture of hemp for the relief of neuralgia. The initial symptoms were those of giddiness, fullness in the head, faintness, a sensation of heaviness and numbness in the feet and legs, followed by partial anaesthesia. These symptoms were soon followed by loss of co-ordination of movement, which rendered the patient unable to walk, or even to stand up. Shortly afterward anaesthesia, not so marked, appeared in the upper extremities, having begun at the tips of the fingers. There was great anxiety and fear of impending death from cardiac paralysis. The heart's action was tumultuous and irregular. On the return of sensibility the patient felt an irresistible desire to commit suicide, but no attempt was made. Fits of alternate laughing and

crying soon appeared, without apparent cause. When the symptoms subsided there came a ravenous appetite, great thirst, and then sleep. Next day, when all the effects had disappeared, the patient remarked that during the intoxication he did not experience a feeling of happiness, but the reverse. In this connection a case of a woman is referred to, where a dose of 40 drops of the tincture only produced a little merriment and laughter, but no bad after-effects.

Capsicum.—The ethereal tincture of capsicum has been employed with advantage as a local remedy by Jas. Sawyer⁶, in cases of subacute gout, chronic gout, chronic articular rheumatism, muscular rheumatism, and also in cases of bronchial catarrh and chronic bronchitis. The general results have been most satisfactory. The drug in this form has been employed by itself or in combination with other adjuvants, of which solutions of ammonia or of oil of turpentine are of service. An excellent and powerful rubefacient liniment may be made of equal parts of the ethereal tincture of capsicum, water of ammonia, oil of turpentine, and linseed-oil. Henry J. Buck⁶, speaks highly of tincture of capsicum as a counter-irritant. He finds it of special value in acute torticollis, where a speedy cure can be obtained by simple local application. It was found useful also in any form of neuralgia, rheumatism, subacute gout, pleurodynia, and other similar affections, in which cases the drug may be applied locally several times during the day and night without producing vesication. Concentrated solutions may be employed in cases of toothache, relaxed sore throats, and other allied affections, by simply painting the parts involved by means of a brush.

Carbolic Acid.—A new so-called chemically pure carbolic acid has been recently introduced. It is manufactured in Ludwigs-hafen, and is distinguished from the ordinary phenol by the absence of the pungent odor. The new product melts at from 40° to 41° C. (104° to 106° F.). This acid has been found by Garré⁶¹ to be less irritating than the common drug, and much less apt to produce chaps and eczema.

Carbon Dioxide.—Attention has been called to the fact that the pain of burns can be quickly assuaged by the emptying of a bottle of seltzer-water on the burnt surface. An abscess can also be opened in this manner.¹⁹³

Cascara Sagrada.—J. V. Stevens¹⁹² uses cascara sagrada to prevent both nervous and biliary headaches.

Castor-Oil.—Four cases where untoward effects were observed after the administration of this common and simple remedy are reported by C. Handfield Jones.²² The most common symptom noticed in these instances was syncope. The results, however, are attributed more to idiosyncrasy than to the quantity of the drug given, as in this connection a case is reported where 12 ounces (384 grammes) of the oil were ingested without producing any disagreeable effects.

Catalpa.—From experiments performed upon the human being, J. Schneck,⁹, has found this plant to produce the following effects: 1. Small doses have little or no effect upon the system. 2. In large doses it slows the heart-beats, weakens the action of the organ, and finally produces an intermittent pulse. 3. It produces mild, cholagogue, cathartic effects. 4. In sufficiently large doses it produces nausea and vomiting, in this way proving beneficial in the treatment of asthma and bronchitis. 5. Through its sedative action on the heart it acts as an antipyretic. The author has found the drug useful in cases of pneumonia, with scanty secretions. It also appeared to increase the secretion of bile. It was used in several cases of influenza with high fever, especially where the inflammation had extended into the frontal sinuses. The drug was employed in the form of tincture in doses of 2 drachms (8 grammes) every one to three hours.

Chloralamid.—Adolph Robinson^{69, 20, 5} has carefully studied the therapeutic uses of chloralamid in the Friedrichshain City Hospital, of Berlin. Chloralamid and somnal were compared in their action in 50 selected cases of various diseases. The patients were divided into three classes: 1. Those who slept soundly. 2. Those who slept moderately. 3. Those who slept very little. Chloralamid produced sound sleep in 13 patients, moderate sleep in 14, and very little in 23. Somnal induced sound sleep in 15 cases, moderate in 13, and very little in 22. Thus it appears that chloralamid failed to produce sleep in 46 and somnal in 44 per cent. of the cases treated. In 3 cases of valvular disease of the heart, chloralamid in doses of 30 grains (2 grammes) in each case produced alarming rapidity and weakening of the pulse. In 1 of these cases the pulse was changed from 62 to 108 per minute,

and the depression lasted for some time. Similar results were noticed in 3 out of 4 patients with typhoid fever, under the same dose of 30 grains (2 grammes). Smaller doses administered to the same patient produced no effect as regards sleep or the action of the heart. Somnal in 30-grain (2 grammes) doses decreased the rate of the pulse, and only produced a broken sleep. The deepest and most prolonged sleep was observed after the use of both drugs in combination. Disturbances of digestion were observed frequently. Somnal in 14 cases and chloralamid in 9 produced abdominal pain. In 2 cases somnal produced severe vomiting, which continued for several hours. The same drug impaired the appetite and frequently caused headache and dizziness. Chloralamid sometimes produced restlessness for a short time, and in 3 cases the excitement lasted for a whole day. Mental excitement appeared to be benefited in some patients by the use of both drugs in repeated doses of 30 grains (2 grammes). In these cases no changes were produced in the heart's action, and the author believes that in this class of patients chloralamid appears to act as promptly as chloral; but, while useful in the treatment of certain cases, the two new drugs will not replace the older and more reliable hypnotics.

With a dose of 1 gramme (15 grains) Reichmann⁵⁰⁵ has noticed marked effects. In a case of bronchitis and cephalalgia, in a woman, 2 grammes (30 grains) produced a whole night's sleep. The same results were obtained in one of chlorosis with mitral insufficiency, and in another of endocarditis in a man who had resisted the influence of morphine. It also produced beneficial results in one case of hepatic colic and in one of intense neuralgia. Drasche does not, however, consider chloralamid a sure hypnotic. He has given it in cardiac affections in doses of 2 to 3 grammes (30 to 45 grains) without causing a marked action either on the heart or the general circulation. It has no cumulative properties. Insomnia, due to acute and chronic mania, toxic insanity, and general paresis, has been successfully treated by F. A. Mayberry.¹⁸⁸ Sleep was induced, on an average, about half an hour after the administration of the drug, and was of a quiet character. No ill after-effects were observed, with the exception of a sense of fullness in the head and slight dizziness in 2 cases of melancholia and some nausea in one of these. The rate of the pulse and the blood-

pressure were but little affected. The drug was administered either in solution or in capsules, in doses varying from 15 to 45 grains (1 to 3 grammes.) W. Hale White¹⁰⁴ reports 20 cases in which good results were obtained, and he believes the drug to be a safe hypnotic, as it produces no depressing effects or indigestion, and very rarely gives rise to any unpleasant symptoms. The diseases in which the drug was employed comprised chiefly typhoid fever, sarcoma, cerebral haemorrhage with noisy delirium, thoracic aneurism, subacute nephritis, mitral regurgitation, ascites, carcinoma, rheumatic fever, erysipelas, chronic eczema, brachial monoplegia, spastic paraplegia, and phthisis. It has been successfully employed as a hypnotic by Malchine⁵⁸⁰ in 17 cases of mental disorders, among which may be mentioned mania, alcoholic delirium, paralytic dementia, subacute articular rheumatism, and others, in doses of from 1 to 2½ grammes (15 to 38 grains).

According to Chas. H. Steele,⁷⁷ chloralamid may be employed in the treatment of simple idiopathic insomnia, not due to excitement or severe pain; but the best results are observed when the drug is given in sleeplessness due to nervousness, hysteria, neurasthenia, spinal disease, or old age. Good results are also obtained in alcoholic excess, chronic alcoholism, cardiac and bronchial asthma, pleuritis, phthisis, pericarditis, arterial sclerosis, organic heart disease, typhoid fever, gastritis, subacute nephritis, ascites, diabetes mellitus, and morphine habit. It is less effective when the insomnia is due to neuralgia, tabes dorsalis, progressive paralysis, excitement of insanity, cerebral softening with delirium, melancholia, chronic and acute mania. In these latter cases large doses must be administered. When the wakefulness is due to paralytic dementia, maniacal excitement or hallucinations, severe neuralgia or other pain, violent cough, distressing headache, delirium of cerebral apoplexy, and delirium tremens, the remedy was found useless. In doses of from 20 to 60 grains (1.3 to 4 grammes) chloralamid was observed to check the pains of thoracic aneurism, carcinoma of the stomach and liver, sarcoma of a rib, erysipelas, rheumatic fever, gall-stone, floating kidney, varicose ulcer, and alcoholic neuritis. The drug was effective in checking the night-sweats of phthisis, and proved of great service in the treatment of chorea of children. A boy of 11 years of age was cured in five days by the administration of 15 grains (1 gramme) of chloralamid

three times a day. In a second case the drug afforded relief in eight days in a girl who had been subjected to other forms of treatment without avail. This drug has been given a fair trial in the Johns Hopkins Hospital, under the direction of Osler.⁷⁸⁴ A full report of its therapeutic uses is given by Harry Toulmin. The remedy was used in 50 cases, and its effects on the pulse and duration of sleep were carefully studied. The diseases treated comprised phthisis, cardiac troubles, chronic nervous affections, diabetes, aneurism, typhoid fever, pneumonia, bronchitis, and others. Untoward effects were noted in 16 cases, in 8 headache, and in 4 a sense of being dazed and confused was noticed, while mental derangement was seen in two instances. The doses varied from 10 to 60 grains (0.65 to 4 grammes), but the largest single dose given was 40 grains (2.65 grammes). No cumulative action was noticed. As a whole, it was found to be an unreliable hypnotic, and, in fact, much inferior to sulfonal or chloral. According to Bilhaut,⁷⁸⁵ chloralamid is a powerful hypnotic, and may be employed without danger in cases of cardiac disease, attended with arterial sclerosis and dilatation of the aorta, complicated with albuminuria; it has no deleterious effect on the heart or kidneys; it does not accumulate in the system until after six weeks of constant employment, every other day; its hypnotic properties are not destroyed even by boiling water, and it may be administered in doses of from 2 to 3 grammes ($\frac{1}{2}$ to $\frac{3}{4}$ drachm) at bed-time. Warren B. Chapin¹, has used it in cases of persistent insomnia, with results far from satisfactory in a general way. He believes it to act, in large doses, as a depressant to the circulation and respiration, and that it cannot, therefore, be used with impunity in cardiac disease. To a robust patient he administered a dose of 3 grammes ($\frac{3}{4}$ drachm) and in two hours a heavy sleep, a rapid and labored respiration,—124,—and a pulse of 105 were produced. Larger doses, in the author's experience, have caused more serious effects. In another case the drug produced at first headache, nausea, vomiting, and great restlessness for eight hours, after which the patient fell into a heavy twelve-hour sleep. He has observed that when chloralamid fails to produce sleep, unpleasant after-effects, such as headache, nausea, vomiting, restlessness, and depression, are sure to occur.

It has been tried extensively at the Los Angeles County

Hospital, and the results reported by W. V. Whitmore.⁴⁴ The doses employed varied from 15 grains to a drachm (1 to 4 grammes), being given with advantage in acidulated solutions. The hypnotic effects were noticed in from fifteen minutes to three hours. An hour was the average time. The sleep produced was peaceful, sound, and uninterrupted, and lasted from five to eight hours. The drug produced no depressing effect upon the heart and could be used with safety in organic cardiac disease. It did not derange the stomach, even in delicate subjects, and had no appreciable effect upon temperature and respiration. Chloralamid was employed in 52 different persons, representing twenty different diseases. Over two hundred single doses were given. The chief symptoms combated were pain and insomnia. The diseases comprised cardiac lesions, uterine carcinoma, asthma, acute mania, acute alcoholism, melancholia, neuralgia, rheumatism, postero-lateral sclerosis, pyo- and hydro-salpinx, and phthisis. The results obtained in a case of cardiac asthma with severe dyspnoea were particularly gratifying. From the first dose of the remedy the dyspnoea was greatly relieved, and the asthmatic attacks were afterward diminished in frequency. The effects of the drug in cardiac asthma were almost of a specific character. Good results were also observed in a case of bronchial asthma. The best effects, however, were obtained in the 9 cases of phthisis treated. Here the drug produced sleep, lessened cough, facilitated expectoration, and, in almost every instance, checked the night-sweats, even when these would not yield to atropia (belladonna) and aromatic sulphuric acid. Of these patients one complained of cerebral disturbance and slight nausea the morning after taking the drug. The same good results were noticed in cases of hysteria, monomania, typhoid fever, and opium habit. Only one negative result was observed, and that was in a case of leptomeningitis, where 30 grains (2 grammes) failed to produce sleep. The advantages of chloralamid over chloral were as follow: the drug caused no digestive disturbances (1 per cent. of the cases); it did not depress the heart or circulation; it seldom produced cerebral disturbances (1 per cent. of the cases). Compared with sulphonal, chloralamid is much more soluble, more rapid in its action, the sleep produced by it passing away by morning, and, finally, it is only one-half as expensive. The collective investigations of the Therapeutic Committee of the British Medical Ass-

ciation have shown that chloralamid possesses some hypnotic properties. In 1 case 20 grains (1.3 grammes) produced sleep within a few minutes and lasted three hours, with half an hour's interval of waking; 30-grain (2 grammes) single doses, administered to 6 patients, caused sleep within fifteen minutes to half an hour in 4 cases, and in 2 in from one to two hours. In 3 of these 6 instances sleep lasted all night, two to five hours in 2 cases, and in 1 case there was two hours' dozing, succeeded by an interval of wakefulness and then by two hours' sleep. In a case of pernicious anaemia, with several weeks' insomnia, thirteen observations were made with chloralamid, and it was noticed that on the night of the ninth day the drug in a 30-grain (2 grammes) dose failed to produce sleep; on the other nights the sleep was restless and wakeful.

Chloroform.—The question of the after-effects of chloroform is treated in an able paper by Ostertag.⁴¹ The author, from the results of a series of experiments upon the lower animals, arrives at the following conclusions: 1. After prolonged inhalation of chloroform, fatty degeneration of different organs, especially of the heart, liver, skeletal muscles, kidneys, and stomach, occurs in animals of widely-different species. 2. The fatty degeneration is the result not only of the action on the blood and the structure of the red blood-corpuscles, but also of a direct local action on the tissue-cells themselves. 3. Certain individuals show such great susceptibility to the action of chloroform by inhalation that they rapidly succumb to its influence. 4. The fatal after-effect of chloroform is attributed to paralysis of the heart, due to an anatomical degeneration of the myocardium, although in certain cases this may only with difficulty be detected, and also to a gradual accumulation of carbon dioxide in the blood. George Eastes⁶_{Apr. 18} does not think that the Hyderabad Commission can draw the conclusion as to the absolute safety of chloroform inhalation in man, as their experiments were made on dogs.

Coca.—In reviewing the therapeutic uses of coca, Marc Lafont¹_{Dec. 1, 1888} holds that the best results in the treatment of disease have been obtained from the use of the plant, and not from the alkaloid, which should be preferred only in special cases where the particular action of the principle is desired; that the chief application of the drug has been as a general tonic for persons either physically or

mentally overworked, and in this connection quotes the names of Brown-Séquard, Germain Séé, Dujardin-Beaumetz, Ball, Bouchut, A. McLane Hamilton, A. E. Macdonald, A. L. Ranney, L. C. Gray, L. Weber, Carlos F. Macdonald, H. M. Lyman, I. N. Danforth, P. S. Conner, J. K. Bauduy, and C. H. Hughes, who have variously employed the drug in cases of the nature indicated. Coca has likewise been employed in convalescence after wasting disease; good results have been observed in the treatment of chlorosis, anaemia, and rachitis by Ch. Robin, Durand-Fardel, Gübler, de Piétra-Santa, Fordyce Barker, Isaac E. Taylor, A. L. Loomis, W. T. Lusk, F. P. Foster, C. C. Lee, J. J. Henna, and L. L. McArthur. The drug has been further used in diseases dependent upon atony of the smooth muscular fibres, among which may be classed atony of the stomach; the remedy being indicated likewise in dyspepsia, where the organ has become weak and torpid and fails to secrete gastric juice. Coca has been found of service in weakness of the vocal cords in cases of singers, ministers, actors, teachers, and orators. With regard to the use of the drug in the first series of cases, the names are mentioned of observers such as de Saint-Germain, Cottin, Dieulafoy, Salemi, Companyo, Rabuteau, A. J. C. Skene, P. A. Morrow, T. C. Giroux, Hunter McGuire, E. R. Palmer, O. O. Burgess, J. R. Leaming, Daniel Lewis, T. E. Satterthwaite, W. H. Pancoast, D. F. Woods, J. N. Hyde, and L. G. N. Denslow. In the treatment of the latter cases reference is made to Ch. Fauvel, Morell Mackenzie, Lennox Browne, Botkine, Cozzolino, Zawerthal, Poyet, Coupard, Fraenkel, Marius Odin, Labus, Massei, Louis Elsberg, R. P. Lincoln, Beverley Robinson, W. C. Jarvis, H. H. Curtis, P. C. Rice, C. E. Sajous, E. Fletcher Ingals, H. Schweig, and T. R. French. Coca has been found of service in the treatment of weakness of the vascular organs in general, whether of an anaemic or plethoric origin, and also in the weakness observed in varicose conditions, in all of which cases the drug appears to regulate the circulation of the nervous centres. These effects are vouched for by Bernard, Bétancès, Landowski, Cazenave-Delaroche, Cazeau, Rabuteau, V. P. Gibney, Robt. Newman, E. B. Bronson, J. E. Janvrin, B. McE. Emmet, W. O. Moore, W. J. Morton, D. W. Yandell, and J. H. Etheridge. Marvelous results under the use of this remedy have been observed in the treatment of mountain-sickness, seasickness, and in the vomiting

of pregnancy. In these cases reference is made to the experience of Cuffer, Letellier, Dérrécagaix, Trossat, Bouloumie, Dechambre, Fordyce Barker, G. F. Shrady, J. H. Douglas, H. T. Hanks, G. R. Fowler, and J. M. Keating. In this connection the case of Gen. Grant is mentioned, where the drug was used to sustain the illustrious patient for several months. Laffont based his studies on Mariani's coca preparations.

Joseph Adolphus²⁰² reports an interesting case, successfully treated by the use of the fluid extract of coca. The affection was attributed to the disturbance of the gastro-duodenal mucous membrane, and presented the following symptoms: insomnia, dyspepsia, tardy digestion, cardialgia, acid secretions, heart-flutter, and, often, nightmare. Constipation was a marked feature of the case, and failing of the eye-sight was complained of by the patient. He was immediately placed under fluid extract of coca, and in two weeks improvement in every respect was noticed. Shortly afterward the nightmare disappeared, the eye trouble was better, the bowels became more regular, and the patient expressed himself as being "really a new man in every way." The influence of coca on accommodation, by strengthening the muscles and relieving the intra-ocular congestion, is pointed out in this particular case. The author also speaks highly of the influence of coca in the catarrhal state of the gastro-duodenal mucous membrane, believing it to act on the vasomotor constrictor fibres of the sympathetic. He found that 2 to 4 grains (0.13 to 0.25 gramme) of good myrrh added to each dose of coca produced remarkably good effects, especially when the tongue was red and parched and the pit of the stomach sore to pressure. A case of oxalic-acid diathesis is also reported to have been cured by the same writer by means of the fluid extract of coca, in doses of 3 drops three or four times a day.

Cocaine.—T. E. Potter²⁰³ has found the drug more valuable when administered in combination with antipyrin. In this way it quiets the irritation; lessens the secretions, and, in many instances, gives immediate relief when pain in the head is present. Its value as a local remedy, in the form of a spray, is highly lauded. An obstinate case of asthma, complicated with a severe nasal catarrh, is reported by the writer to have been greatly relieved by the use of cocaine. The same author has found the drug of much service

in the treatment of nausea and vomiting and throat affections, and has observed excellent results in cases of melancholia. He has used the remedy locally and internally, and has observed serious effects from its local application. He speaks of a case in an adult where a spray of a 4-per-cent. solution was followed by a serious interference of the respiration within a few minutes. In obstinate itching of the skin, an ointment of 20 grains (1.3 grammes) of the muriate of cocaine to the ounce of vaseline has given great relief. In neuralgia of the testicles, back, or bladder, good results have been obtained from urethral injections of $\frac{1}{2}$ drachm (2 grammes) of a 4-per-cent. solution.

Golovkoff,⁶ in the proceedings of the Caucasian Medical Society, reports a case in which alarming symptoms of cocaine poisoning were overcome by the use of ammonia, given internally and by inhalation. An interesting and apparently new effect produced by cocaine has been observed by J. W. Stickler.⁵⁹ An adult, 30 years of age, suffering from toothache, was given hypodermatically, in the cellular tissue between the cheek and gum, about 5 drops of a 4-per-cent. solution. Relief was obtained almost immediately, but in the course of five minutes the entire left side of the face became enormously swollen, tense, and painful, and so rapid and extreme was the swelling that the physician was thought to have punctured some large blood-vessel. To allow the escape of supposed clotted blood, operative measures were resorted to, but revealed the *non-existence* of any coagulum. The local application of Goulard's extract and opium reduced the swelling in four days, and no other bad effects were noticed. With such an experience, the author condemns the injection of the drug into the loose areolar connective tissue in the region of the face, as it may produce the peculiar painful effect described, due, probably, to paralysis of the vasomotor nerve-filaments, causing dilatation of the blood-vessels and intense congestion of the respective part. An injection into the gums of an adult woman, by a dentist, was followed by no anæsthetic effects, but by a hysterical condition, with glistening eyes, dilated pupils, cold and numbness of body, partial loss of speech, and a quick, feeble, and compressible pulse. Administration of stimulants succeeded in producing recovery. The case is reported by H. Isaac Jones,⁷⁰ who further quotes Beynose, of Lima, as affirming that cocaine acts on the

renal secretion by preventing the elimination of the products of oxidation, and thus producing convulsive attacks of a nervous origin.

Hueber,⁶ reports the case of a healthy young soldier who exhibited poisonous symptoms after the use of cocaine. A small quantity (about $1\frac{1}{2}$ grains—0.10 grammes—of a 2-per-cent. solution) was dropped into the nostril, previous to the removal of a polypus. Shortly after the operation the patient suddenly became unconscious, with an excessively weak pulse and a cold skin. He was revived by stimulants, but did not make a rapid improvement, as he suffered, for some time afterward, from extreme weakness and quivering of the muscles. He was obliged to stay in bed for fifteen days, and did not return to duty for about ten weeks.

S. T. Earle,¹⁰⁴ reports the case of a man 65 years of age in whom the hypodermic use of $\frac{3}{4}$ grain (0.05 grammes) of cocaine produced sudden depression of an alarming nature. The injection of nitro-glycerin and the administration, by inhalation, of nitrite of amyl, followed by the free use of whisky, saved the patient. To an apparently healthy individual, 24 years of age, 10 minims (0.67 grammes) of a 15-per-cent. solution of cocaine were given hypodermatically. Immediately afterward the patient was seized with distressing dyspnœa, pallor of the face, widely-dilated pupils, spasms of the flexor muscles of the arms and legs, hurried respirations,—40 per minute,—and a very small, wiry pulse, running to 140 per minute. There was profuse perspiration, but at no time loss of consciousness. The case is reported by John A. Wessinger,¹ who further states that under a hypodermic injection of $\frac{1}{2}$ grain (0.008 grammes) of morphine and $\frac{1}{200}$ grain (0.0003 grammes) of atropine the patient rallied in the course of twenty minutes sufficiently to undergo a minor surgical operation. In order to prevent the toxic effects sometimes following the use of cocaine, a series of experiments has been instituted by Isidor Gluck,⁵⁹ who has found that the alkaloid, in combination with phenol, exhibits greater power, and never produces deleterious effects. He has extensively used the following formula:—

R Phenol,	gtt. ij.
Aq. destillatae,	3j (4 grammes).

Shake until solution is perfect, then add 10 grains (0.67 grammes) of cocaine hydrochlorate. The combined actions of the

drugs seem to intensify the anaesthetic effects. The author holds that phenol, by coagulating albumen and fats and producing a very superficial scar, prevents the absorption of cocaine, and hence its bad effects. He finally concludes that the above combination prevents toxic but increases the anaesthetic effects, prevents congestive reaction and the decomposition of solution, and renders the solution aseptic. For the production of local anaesthesia in genito-urinary troubles, when the hydrochlorate of cocaine fails to produce the desired effects, Lavaux¹⁷ recommends the use of the nitrate of the drug, which may be prepared as follows: 0.95 gramme of nitrate of silver and 2 grammes ($\frac{1}{2}$ drachm) of the hydrochlorate of cocaine are dissolved each in 10 cubic centimetres (3 fluidrachms) of distilled water. The solutions are then mixed, and a precipitate follows of the chloride of silver. The filtrate consists of the nitrate of cocaine, which is then ready for general use.

Cocillaña.—Of the therapeutic uses of this new drug but few new reports have been made. In fact, after the papers of Rusby, Landry, and Stewart, of which mention was made in last year's ANNUAL, but few articles have come under our notice dealing with the therapeutic effects of the drug in question. Reynold W. Wilcox⁵⁹ reports 9 cases where the drug was used chiefly as an expectorant in diseases of the respiratory organs. It was found most useful in cases of subacute and chronic dry bronchitis, and in such instances proved superior to either apomorphine or ipecacuanha. The cocillaña liquefied the mucus of the bronchi, increased the appetite, and sometimes acted as a laxative. It was, however, contra-indicated in certain cases of senile bronchitis, especially in those presenting calcified costal cartilages, where it might add to the bronchorrhœa, and become, then, a dangerous remedy. In such cases it only did good so far as it liquefied the secretion. Cocillaña is not a respiratory stimulant, and therefore only relieved the acute exacerbations of associated chronic bronchitis. It diminished the cough and expectoration, and under its use the night-sweats, constipation, and lack of appetite were relieved. The author considers cocillaña safer in any stage of bronchitis than pilocarpine, as it does not depress the heart's action, but it is inferior to carbonate of ammonium in senile bronchitis. It was useless, like all other expectorants, in the cough due to

pleuritic exudation, or of a laryngeal or pharyngeal character. The author employed the concentrated tincture in doses of from $\frac{1}{2}$ to 2 drachms (2 to 8 grammes), given every two or eight hours, and the fluid extract in doses of from 5 to 25 minims (0.33 to 1.65 grammes). He preferred the latter preparation, owing to its lack of alcohol.

L. Harrison Mettler,⁵⁹ reports 5 cases of acute and subacute and chronic bronchitis, broncho-pneumonia, and phthisis in which the use of the drug was followed by the happiest results. He found it, as a whole, to be a stimulant expectorant in therapeutic doses. In larger quantities it acted as an emetic and cathartic, influencing especially the alimentary mucous membrane. A feeling of weakness and depression followed the ingestion of full doses, which, together with the fact that it is a stimulant in the form of the tincture, led the author to contra-indicate it in phthisis and in those pulmonary affections accompanied by marked emaciation and debility. The best results were obtained from the use of the drug in cases of subacute and chronic bronchitis, where cures were secured in some instances. It was inferior, however, to the ammonia salts in the treatment of capillary bronchitis and the chronic forms of broncho-pneumonia. The author preferred the use of the fluid extract in doses of 10 to 15 drops every three or four hours.

Codeine.—This drug has been studied therapeutically by G. Kobler,⁸ in the clinic of Schrötter, of Vienna, especially in cases of tuberculosis of the lungs and larynx. In 70 patients, of different ages, the drug was employed in doses of from $\frac{1}{2}$ to $\frac{3}{4}$ grain (0.03 to 0.05 gramme) each. Two to 3 grains (0.13 to 0.20 gramme) were administered in the twenty-four hours. Smaller doses were inefficacious. No untoward after-effects were observed, even after the constant administration of the drug for a period of six weeks. One case of stricture of the rectum, due to a severe attack of dysentery, and complicated with violent bronchitis and laryngitis, is particularly mentioned, where codeine, given in the form of suppositories containing each $\frac{1}{2}$ grain (0.03 gramme), produced excellent results: the local pain in the bowels and the cough were greatly relieved. The drug produced better results when given in single large doses than when administered in divided quantities. Thus, the case of a phthisical patient is men-

tioned where 2 grains (0.13 gramme) of the remedy, ingested in divided doses during the day, were followed by only a slight narcotic action. The same patient exhibited marked narcosis under $\frac{1}{2}$ grain (0.03 gramme) of codeine in the morning and an equal amount in the evening. In a few cases, especially those of advanced phthisis, codeine produced fullness in the head, dizziness, and slight nausea, and in these instances it was found better to administer the drug in small quantities. The author observed another advantage of codeine over morphine in the treatment of bronchial catarrh, viz., that it facilitated expectoration. In both acute and chronic cases it not only diminished the violence of the cough, but also enhanced the removal of secretion. In many cases of idiosyncrasy against morphine codeine was used with advantage, and the author refers to a case of incipient phthisis where the violent cough was relieved by its use after other measures and treatment had failed. He concludes, finally, that in cases of intolerance to morphine codeine is of the greatest service, as it never produces nausea, vomiting, loss of appetite, or constipation; while it reduces the cough and renders expectoration easier. Lœwenmeyer,^{4, 15} has employed the drug in 400 cases, in which 5000 doses were given. He found, as a general result, that in its action codeine was analogous to morphine, but less powerful and free from deleterious after-effects. It was of value in painful disorders of the abdominal and pelvic organs, such as gastralgia, colic, and visceral neuralgia. No good results, however, were obtained from its use in the pains of ulcer and cancer of the stomach, and similar affections of the intestines and peritoneum. In these cases morphine had to be resorted to. While the latter is effectual in from 90 to 95 per cent., codeine produced good results in from 50 to 60 per cent. of the cases treated. Codeine appeared powerless in controlling paroxysmal pains, such, for example, as those observed in hepatic and renal colics. Neither was the alkaloid of much value in acute, circumscribed inflammations, where a restraining of peristaltic movements seemed to be indicated. It was useful, however, in relieving pain after the acute inflammation had subsided, and also in controlling pain in the genito-urinary tract, and was of special service in diseases of the respiratory organs. In phthisis it relieved pain in the side, dyspnoea, and irritating cough, conditions

in which morphia is contra-indicated. Good results were observed in cases of bronchial catarrh, pleurisy, and pneumonia, and it also shortened the duration and severity of the paroxysms of asthma. Codeine may be used, and often with good results, in cardiac disease, where disturbance of compensation, arhythmia, or dropsy is present. It was not so effective in nervous affections, but in mild excitements and sleeplessness during convalescence it produced good hypnotic effects. An advantage observed by the author in the use of codeine was that the remedy produced no untoward and injurious effects upon the system, and that it, therefore, can be given for a long time without causing serious disturbances. The general dose varied from $\frac{1}{2}$ to $\frac{1}{4}$ grain (0.03 to 0.05 gramme), and it could be given in doses as high as $\frac{1}{2}$ grain (0.03 gramme) five times a day. The action was observed to last for weeks and even months, and no evil results were noticed. It was given in powder with saccharin, in suppositories, or in a mixture with syrup.

Codliver-Oil.—Gautier and Mourgues¹⁰⁰ attribute the beneficial effects of codliver-oil to the fats which it contains; to the phosphates, phosphoric acid, lecithin, and phosphorus present in organic combination; and to the several alkaloids, such as butylamine, amylamine, morrhuine, and morrhuic acid. These latter especially are said to be nerve-stimulants, rendering more active the nutritive processes, increasing the amount of urine and sweat, and promoting, at the same time, the appetite. Amyline is considered a powerful poison, producing, in small doses, increase of the reflexes and convulsive tremblings.

Creasote—Creasoted Oil.—Perron⁷⁰ praises the hypodermatic use of creasote in the treatment of phthisis, as by this means the medicament can be introduced into the circulation without any derangement of the digestion. His method is to antiseptically introduce the point of the syringe into the cellular tissue of the external iliac fossa, and then to slowly inject a 10-per-cent. solution of creasote in the oil of sweet almonds. The usual small syringe can be used, for when it is emptied the body can be detached without removing the point, again filled, and the injection continued into the same spot. Two injections of 5 grammes ($1\frac{1}{4}$ drachms) each of the above solution are to be given daily. The oil is also assimilated and proves of advantage to the patient. Kenneth Gunsolus³⁹ reports an interesting case in which a new effect of creasote

was observed. The patient had been complaining for two or three years of pain in the bowels, constant diarrhoea, cough, with profuse expectoration, and a rise of temperature in the afternoon. Tuberculosis of the lung was suspected, and in the mean time a mixture containing creasote was prescribed. In a week the cough improved and the expectoration was greatly lessened, but the bowel complaint continued as before. On the ninth or tenth day, however, after taking the medicine, a tape-worm measuring 43 feet long, head and all, was passed. From this time on, all the symptoms complained of before, including a voracious appetite, rapidly subsided and the patient finally made a complete recovery. The case presents an important practical point, namely, the anthelmintic properties which the drug may possess. In an able and exhaustive article on the "Uses of Creasoted Oil in Intra-Tracheal Injections," Dor⁹² arrives at the following conclusions: 1. Intra-tracheal injections of creasoted oil, of the strength of 1 in 20, are admirably borne by the majority of patients. Thirty-one minims (2 grammes) may be injected twice a day, this equaling 3.1 grains (0.206 gramme) of creasote. No complications provoked by the use of the injections were ever observed. The patients never had hæmoptysis, fever, or stitch in the side, which could be attributed to the medicine, and digestive troubles were not produced analogous to those seen when creasote is administered internally. 2. Experiments showed that the oil reached the alveoli and stayed there fifteen days; that it is undesirable to make use of glycerin or vaseline as an excipient, but that olive-oil, sterilized by boiling, should be employed. 3. The injections of 31 minims (2 grammes) of the oil twice daily should be practiced during many months. It is necessary to auscult the patients frequently, and to make them take the position necessary to allow the oil to penetrate to the diseased portions of the lungs. It is often possible to determine whether the oil has reached the part by the production of bubbling râles. 4. In the majority of cases under the influence of this treatment, expectoration diminished, pain in the side disappeared, appetite returned, and weight increased. The auscultatory signs were somewhat modified. 5. It is principally tuberculous patients in the first or second stage who are benefited by the treatment. For patients with numerous cavities, it would be much better to choose an anti-septic more powerful than creasote, and camphorated naphthol

appears to answer this purpose. A solution of one-tenth strength is tolerated by the trachea, but the influence of this substance on foci of suppuration in the lungs was not studied.

Creasotinic Acid.—According to Demme,⁶⁵⁰ no marked effect is produced upon the human healthy organism by doses of 45 to 60 grains (3 to 4 grammes) of creasotinic acid, with the exception of a feeling of great fullness of the blood-vessels of the skin, a light pulsation of the arteries, and a moderate perspiration. No influence was exercised on the digestive functions. The author claims that the drug, in small doses, acts favorably in some cases of typhoid fever, diminishing the number and quality of the intestinal evacuations. Children bear the drug very well. Lobular pneumonia pursues a normal course under creasotinic acid, while in catarrhal lobular pneumonia the remedy appears to reduce the fever and shorten the morbid processes. In tubercular phthisis a large single dose reduced the temperature. Thus, in a boy 12 years of age, 15 grains (1 gramme) were given every five hours, and even larger doses produced no untoward after-effects. The temperature was reduced 2°. In some cases, however, the remedy produced collapse and an erythematous eruption.

Creolin.—Besides the antiseptic and germicidal powers of creolin, it has been found that the drug is an excellent provoker of suppuration. Thus, of all the products experimented with, Janowski, of Warsaw,²⁹⁸ has observed that creolin is one of the few substances capable of producing suppuration *by itself without the least intervention of micro-organisms*. The drug excites a purulent secretion devoid of micro-organisms. From experiments made in different animals, it was found that creolin produced suppuration in about three days after the injections.

Cyanin.—See Aniline.

*Elder (*Sambucus Nigra*).*—Since Combemale, in November, 1889, communicated to the Société de Biologie the diuretic properties of this drug, very little work has been accomplished toward establishing its value in practical medicine. Georges Lemoine⁵⁵ appears to have especially studied its properties and uses. According to Combemale, the watery extract of the bark, freshly prepared, given to the lower animals, produced not only a marked increase in the amount of urine, but also a noted diminution of the temperature and of the frequency of the pulse and respiration.

Sometimes nausea and vomiting and abundant diarrhoea were produced, these effects being attributed to the volatile principle contained in the bark, as they were not present when such a principle was eliminated by decoction. Lemoine applied these physiological results to clinical observations, and found that the drug produced diuresis when employed in cases of ascites and anasarca, especially of cardiac and renal origin. The drug increased the amount of urine nearly eightfold, and the effects remained during the whole period of administration of the remedy. The author employed it in nephritis, especially in the acute congestive form, where its action was more rapid than in chronic Bright's disease. Excellent results were obtained in 3 cases of acute nephritis, especially in that of a woman 32 years of age, who had considerable anasarca, fluid being contained in the peritoneum and pleura, and death being threatened from œdema of the lungs. After the first day's use of the decoction of elder the urine nearly doubled, and on the fourth day the excretion was increased to nearly ten times as much as at first. The anasarca rapidly diminished, and both the number of diarrhoeic stools and the quantity of urine were reduced until the effusion had been entirely removed from the cellular tissue. The result was not so satisfactory in cases of chronic nephritis, but the writer states that the drug will do good in the majority of cases, in œdema of cardiac disease. In fatty heart, where digitalis cannot be supported, elder-bark will render great service. The drug, as a whole, caused no untoward after-effects, and it seemed, without affecting the heart or the circulation, to act simply as a diuretic by irritating the renal epithelium ; but no changes are produced in the character of the renal cells, since microscopical examination of the kidneys of animals that had been subjected to the action of the drug for over a week showed no organic change. A case is also mentioned of ovarian cyst, where the abdominal ascites was reduced by the use of the drug, the effusion returning after the remedy had been withdrawn.

Ether.—Horatio C. Wood's powerful address at Berlin in favor of the use of ether² as an anæsthetic has been much commented upon. George Eastes⁶, believes that the previous administration of nitrous oxide greatly facilitates the administration of ether.

For certain adynamic types or periods of maladies, hypodermatic injections of several active remedies have been employed,

with alleged satisfactory results. Peter, of Paris,⁷⁶⁰ has used in influenza, and the weak states that follow it, injections of ether, which appeared to act remarkably well, especially so in those cases in which pneumonia ensues. Jaccoud has likewise resorted to injections of ether when the patients seemed to be failing, and advises an injection every morning and evening, and, if the patient grows weaker, two injections, night and morning, from the third to the sixth day, particularly in those cases of pneumonia following the "grippe." As these injections are painful, some authors believe that they should be reserved for the adynamic periods of typhoid fever and other extremely serious cases. Roussel proposes the arseniate of strychnine for hypodermatic injections, claiming that the drug produces as good an effect as any other and is not painful to the patient.

Eucalyptus Rostrata.—With this substance, commonly called "red gum," W. M. Russell,² has relieved many cases of seasickness when all other treatment and measures had failed. It was usually administered in the form of lozenges, containing 1 grain (0.07 gramme) of the drug each. Of these, 3 or 4 during the day were sufficient to produce the desired result.

Euphorbia Pilulifera.—Rosecrans Workman⁸⁰ has used this drug in practical medicine with apparent success. In 13 cases of hay asthma prompt relief was obtained in 9; sneezing and discharge were diminished or stopped. In these cases the fluid extract was used in doses of 30 to 60 minims (2 to 4 grammes) every four hours. Good results were obtained in 6 out of 9 cases of coryza. The sneezing and rhinal flow diminished or ceased within thirty-six hours after the ingestion of the drug. Of 5 cases of asthma, only 1 received marked benefit, where the attack was always shortened and the dyspncea entirely relieved.

Fluoroform.—Meslans,⁶ appears to have discovered a compound of fluorine and methane, similar to the chemical composition of chloroform and iodoform. At the ordinary temperature this new chemical compound is a gas.

Fusel-Oil.—A case of fusel-oil poisoning in a man 64 years of age is reported by T. P. Cowen.⁶ The symptoms, which only began to manifest themselves four hours after the ingestion of the remedy by the mouth, were as follow: unconsciousness; rigidity (in an extended position) of the muscles of the arms and legs; bluish face;

teeth tightly clenched; pulse scarcely perceptible at the wrist; breathing shallow and slow; pupils small, feebly acting to light; absence of conjunctival reflexes; coldness of surface of body; odor of breath resembling pear-drops or nitrite of amyl. Notwithstanding the removal of the contents of stomach by the pump, the symptoms continued gradually to present a more aggravated form. In the course of a short time the cyanosis of the face and ears became deeper, the breathing shallower and slower, until it ceased entirely. The heart continued to beat. Artificial respiration being resorted to, natural breathing was resumed, but it soon ceased again. Then the whole body of the patient became limp and the pupils larger. An injection of 20 minims (1.30 grammes) of ether was administered hypodermatically, and 1 ounce (32 grammes) of brandy given by the rectum. The general condition soon improved, breathing became more regular, the color of the face more natural. The pupils kept on dilating, however, and the loss of consciousness persisted. When, several hours afterward, consciousness began to return, the patient vomited several times, the matter vomited consisting chiefly of mucus, and having the same peculiar odor of the breath, that of nitrite of amyl, or pear-drops. There was copious sweating in the evening, and the sweat exhibited the same odor referred to, this being also noticeable in the urine, which was drawn by the catheter. The patient finally recovered in the course of four days, but the bluish tinge of face and ears and the peculiar odor of the breath were still observable on the fourth day. One of the features of the case was that the exhalations of the patient's breath caused giddiness, frontal headache, and a feeling of malaise, in those attending him, which lasted for several hours.

François Hue²⁰⁸ describes a case of fusel-oil poisoning. A sober man, aged 59, for over thirty years employed in a distillery, was seized while at work with faintness, restlessness, and loss of appetite. On reaching home he was obliged to go to bed, and suffered from the following symptoms: considerable general paresis, with loss of sensation, feebleness of vision, buzzing in the ears, and headache. These symptoms were almost absent when lying on his back. On arising there also appeared vertigo, and at times diplopia. The intellect was dull, and formication of the hands, without trembling, occurred. Medication seemed to

have had but little effect, and two and a half months afterward there remained traces of the poisoning.

Hæmoglobin.—*Hæmoglobin compound* is a name given by F. E. Stewart¹⁸⁶ to a combination of fresh blood with extract of malt, glycerin, and whisky. It has the taste of nothing but malt, can be given in teaspoonful doses for adults, and in drops for bottle-fed infants, 5 to 15 to each feeding. The good effects are considered to be due to the hæmoglobin, iron, creatin, creatinin, mineral salts, and small quantities of alcohol present. They are all stimulants, and wonderfully invigorate weakened systems. O. H. Allis²⁰² details 2 cases, 1 of a man 70 years of age, the other of a young man of 23, both of a desperate nature, owing to exhaustion due to various causes. Under the blood treatment the first apparently recovered in two months, the second was greatly improved in a few weeks. E. J. Pring²⁰² reports the case of a woman with a weak heart's action, who improved under the use of hæmoglobin compound, and speaks of other cases that were greatly benefited by this agent.

Hæmostatics.—In a communication to the Société de Médecine Pratique, Moncorvo²⁴ has given the results of his experience with antipyrin, thallin, antifebrin, and phenacetin as hæmostatics. Most favorable results have followed the use of these drugs for the control of hæmorrhage from whatever cause. Clinical evidence has corroborated experimental evidence. Antipyrin and thallin, which were found to be superior to the perchloride of iron and ergotin, were equally powerful, controlling hæmorrhages in from four to five minutes when locally applied. Moncorvo reports several medical and surgical cases in which antipyrin was effective, even in cases where iron, ergotin, boric acid, and other drugs had failed. He considers thallin, as a hæmostatic and cicatrizing, as powerful and active as antipyrin.

Helleboreine.—A solution of helleboreine dropped upon the eyes of rabbits and dogs produced complete anaesthesia of the cornea without alteration of the pupils. Three to 4 drops of the drug solution, each of which represented $\frac{1}{164}$ grain (0.0004 gramme), produced these remarkable effects. No after-effects followed, the anaesthesia lasting half an hour. It is to be preferred to cocaine, as it produces no irritation and the anaesthesia lasts longer. It causes no change either in the pupil or in the intra-ocular pressure. It also produces anaesthesia locally at any point where it is

injected. These studies were made by Vittorio and Elvidio,⁴¹ who also stated that it is a heart-poison and must be employed with care.

Hoochinoo.—J. Marshall,¹¹² from a study of the native drink of Alaska, concludes that the effects observed after its use are due to the large quantity of alcohol which it contains and the rapidity with which it is absorbed, and not to any poisonous substance contained in the *hoochinoo*.

Hydracetin.—E. Basch¹ doubts the good effects of hydracetin in diseases of the skin, as it is very poisonous, even when applied locally. It was found useful in small patches and areas of psoriasis, but inferior to pyrogallol and chrysarobin. Evil effects followed its local use in a case of general psoriasis: after ten days' treatment the mucous membrane became pale, hæmoglobinuria and jaundice appeared, and the pulse became very rapid. The disease was, however, not benefited.

Hydrastinine.—Through oxidation of hydrastine a new substance is obtained which Freund has named hydrastinine. This is slightly soluble in water. It is white in the pure state, and its salts, especially the hydrochlorate, are readily soluble. Falk,¹¹⁶ who has tried it in uterine hæmorrhage, has found it invaluable; 26 cases were treated, with 22 cures. It was employed hypodermatically, and patients felt less discomfort after its ingestion than after ergotin. One case, however, a neurotic patient, rebelled against the use of the remedy, owing to pain, nausea, and vomiting produced by it. The amount injected, as recommended by Falk, was from $\frac{1}{2}$ to $\frac{1}{6}$ grain (0.005 to 0.01 gramme).

Hydrastis Canadensis.—Marfori⁵⁵, has published a series of researches on the alkaloids of golden seal,—hydrastine, berberine, and their derivatives. Hydrastine, intra-venously injected in the proportion of $\frac{1}{4}$ grain (0.001 gramme) for every 2 pounds of body-weight, produces constant diminution in the volume of kidneys. In doses of $\frac{1}{20}$ to $\frac{1}{10}$ grain (0.003 to 0.001 gramme) for every 2 pounds of body-weight the blood-pressure increases; the pulse is also increased by small doses. Large amounts diminish both pressure and the frequency of the cardiac beat and increase the systolic contraction of the heart. He asserts, likewise, that hydrastine, in small quantities, diminishes the calibre of the blood-vessels. The acceleration of pulse is attributed to

excitation of the accelerator nerves of the heart; the subsequent slowing, to stimulation of extra-cardiac centres of the pneumogastric nerves. Hydrastine stimulates spinal centres, followed by clonic and tetanic convulsions, and finally paralysis. The drug has a certain cumulative action, and is eliminated by the kidney particularly. No traces of it were found in the bile. Berberine produces elevation of pressure in large doses,—a result which is concordant with those observed by Curci and Shurinoff. Small doses have no action on blood-pressure, on the blood-vessels, or the volume of the kidneys. Hydrastinine, produced from hydrastine by a process of oxidation, is much less efficacious in its influence on blood-vessels and arterial pressure. Hydroberberine, whose molecule contains four atoms of hydrogen more than the molecule of berberine, appears to produce elevation of blood-pressure by stimulating the vasomotor centres. Opianic acid, another product of the oxidation of hydrastine, has no appreciable physiological effects, either on cold- or warm-blooded animals; but it possesses an action as a preventive of putrefaction. Analogous results were observed with hydrastinic and berberinic acid, also products of the oxidation of hydrastine. Excellent results have been observed by H. M. Jones,²² from its use in menorrhagia and metrorrhagia and in some cases of haemoptysis and epistaxis. His experience confirms that of Goth, that the drug is of especial value in haemorrhages of the menopause, when there is no organic change in uterine tissues. Internally he has combined it with ergot, ergotin, sclerotic acid, cannabin, and digitalis. He found valuable a combination of hydrastis and sclerotic acid in the treatment of haemoptysis and epistaxis. In cases of myoma the results were unsatisfactory. The tincture of hydrastine produced good effects in cases of atonic dyspepsia and general debility, commonly met with in women who have suffered from menorrhagia. The local use was found as important as the internal administration; thus, it has given excellent results in chronic endometritis, cervical erosions, and congestive states of the uterine cervix. It may be applied as a cervical dressing on the vaginal tampon, or added to the water used for the hot douche.

Hydrochinone.—Brieger in 1877, Seifert and Steffen in 1883, and Silvestrini and Picchini in 1886, announced, from clinical and experimental evidence, that hydrochinone possessed antithermic

properties. Gaetano Traversa¹⁵² has recently studied the subject with similar results. He has found that the drug lowers both physiological and pathological temperature, this diminution being less marked in healthy individuals. The antipyretic action is not accompanied by untoward symptoms, unless very large doses are employed, when depressing phenomena are observed: slowing of pulse and pressure, especially in febrile cases; sweating and chills. Animals are more susceptible to the drug than man, producing in them convulsions in toxic amounts. Its action varies even in the same individual. Hydrochinone reduces temperature by increasing heat dissipation and diminishing heat production. Urea, sulphuric and phosphoric acids, and sodium chloride are all diminished by the drug.

Hydrochloric Acid.—A fatal case of poisoning by hydrochloric acid is reported by P. J. Duncan.⁶ The patient took about an ounce (32 grammes) of the drug by mistake, and the usual corrosive symptoms followed. Death ensued on the ninety-fourth day, and the lesions found were: general contraction of stomach, especially at the pyloric end; the adjacent gastric wall was firmly contracted and thickened.

Hydrogen Peroxide.—In the hands of T. S. K. Morton⁹ the hydrogen solution has proved most successful in the treatment of tubercular abscesses and sores of all kinds. In general ulcers the results have been surprising, as also in burns. It is superior to anything employed by him before in keeping drainage-tubes and deep cavities clean and sweet. It is extremely effective and free from toxic effects. He reports an obstinate case of purulent ophthalmia of several weeks' standing that was cured by two instillations of the drug. In septic conditions of the different regions and for cleansing purposes the hydrogen peroxide was found invaluable; but he does not believe that it will supplant bichloride of mercury. Simple wounds have healed up as under other antisepsics.

R. T. Morris considers the peroxide of hydrogen the best antiseptic so far known, as it immediately acts upon and prevents suppuration. He has used it successfully in abscess of the brain, in appendicitis, in purulent conjunctivitis, and in many other cases where suppuration is the chief feature. In affections of the eye, nose, and urethra its use may be preceded by cocaine or ether

to prevent smarting. In old sinuses he has followed its employment with balsam of Peru, which encourages granulation. Diphtheritic membranes are easily removed by it. Wherever there is pus peroxide of hydrogen should be used. The substance should not come in contact with metals, nor with the hair, as it bleaches the latter. A solution, kept tightly corked in a cool place, remains active for many months. This is also the view of Manassein,¹⁰⁰ who believes that it is not an unstable preparation if kept in a dark and cool place. He pronounces it an excellent antiseptic and disinfectant, and especially valuable in herpes progenitalis, soft chancres, and gonorrhœa. This latter disease is, he asserts, cured by the remedy, in injections, in from eight to twenty-four hours. It is free from odor, does not stain linen, and gives rise to no local pain or irritation or general untoward effects.

Hydro-Naphthol.—K. Mitchell Clarke¹⁵ has published results obtained from the use of hydro-naphthol in the treatment of enteric fever and diarrhœa. Hydro-naphthol is prepared from beta-naphthol; it is less soluble in water, melts at lower temperature, and gives a deep yellow-brown color with tincture of iron. It has a faint odor of phenol and is said to be absolutely innocuous. While retarding the digestion of egg-albumen, it influences very slightly that of milk; therefore, it may be given to patients placed on milk diet without interfering with digestion. Five cases of typhoid fever were treated by Clarke with good results. Two of them were severe and prolonged, owing to diarrhœa, which ceased soon after the ingestion of the drug, which should be continued during the whole period of pyrexia, even after diarrhœa has been checked. Dose, 3 to 4 grains (0.20 to 0.25 gramme) every two hours. The drug is useful in all diarrhoeas. In 6 cases of diarrhœa of children it failed in 1; the others were checked in from twelve to twenty-four hours; it was successful in 2 cases of dysenteric diarrhœa and in tuberculous diarrhœa in a girl of 14. It did no good in cases of flatulent dyspepsia and dilatation of the stomach.

Hydroxylamine.—Groddeck²⁸ has been unable to confirm the statements of Eichhoff and Fabry as to the value of hydroxylamine in skin diseases. It was found inert in solutions of 1 per 1000, somewhat irritant in those of 2 to 5 per 1000, and always irritating in 1-per-cent. solution. Groddeck considers it dangerous in private practice, as it produces local dermatitis and constitutional

symptoms, and he thinks it far inferior to chrysarobin and pyrogallic acid. More recently Eichhoff has sustained its beneficial effects, particularly in psoriasis and tinea tonsurans.

Hyoscine.—Kobert and Sohrt and Konrad and Schleusner,²⁴ have studied the physiological effects of this drug. They found that it is eliminated as such from the system; that it retards respiration, slows the pulse, dilates the pupils, diminishes salivary secretion and perspiration; but that it has no apparent action on the cord or motor area of the brain. In clinical medicine it was first used by Hirschberg in 1881. Since then many others have used it in ophthalmological practice, especially as a mydriatic. Kuhlwetter used it subcutaneously in doses of from $\frac{1}{650}$ to $\frac{1}{32}$ grain (0.0001 to 0.002 gramme), and, according to Erb, Kly, and Klinke, quantities of from $\frac{1}{130}$ to $\frac{1}{5}$ (0.0005 to 0.001 gramme) grain are devoid of danger. Internally it may be given in doses of $\frac{1}{32}$ grain (0.002 gramme), its action being less dangerous and very enduring, especially in psychoses.

K. L. Pavloff,²⁵ under Popoff, of St. Petersburg, has made a remarkably thorough study of the physiological action of hyoscine hydrochlorate upon cold- and warm-blooded animals. Upon the first, minute doses (less than 0.001 gramme— $\frac{1}{4}$ grain) slow the action of the heart by stimulating the peripheral cardio-inhibitory apparatus. Larger doses accelerate cardiac action, increase muscular contractility, irritability of spinal cord, and conducting power of motor nerves; they also slightly depress the excitability of peripheral sensory nerves. Still larger doses intensify these symptoms, lowering reflex action. Toxic amounts produce diastolic arrest of heart, loss of reflexes and of function of both sensory and motor nerves, and finally cerebral paralysis. On warm-blood animals, as dogs and rabbits, hyoscine at first diminishes and afterward increases the cardiac beats by a primary stimulation and a secondary paralysis of the peripheral cardio-inhibitory apparatus. Subsequently the drug diminishes the pulse by depressing the excito-motor apparatuses of the heart. The pressure is increased through stimulation of spinal and vaso-motor centres; it is later depressed, owing to exhaustion of cardiac muscle. It retards respiration, diminishes secretion of saliva, depresses irritability of motor area of cerebral cortex, and lowers pathic sensibility. It causes prolonged dilatation of pupil, due to stimulation of sympathetic nerve.

The drug has no action on peripheral or visceral temperature, nor does it accelerate the process of deoxidation of the blood. Its action would seem to resemble that of atropia, but it differs from this in that it depresses cerebral irritability. From the behavior of the drug, Pavloff believes that it may prove useful in the treatment of mental affections.

In a chemical analysis made of a so-called hydrobromide of hyoscine, Schmidt,⁷⁴⁴ found this salt to respond to the reactions of the aurochloride salt, and thinks, therefore, that many of the hyoscine salts of commerce differ from one another, which explains the existing diversity of opinion as to the action of such a drug. Excellent results have been obtained by Wetherell,⁵⁰⁵ in the treatment of the insomnia of acute delirium, of melancholia of the morphine habit, of alcoholism, and of the chronic mental disorders, by the use of this drug. Bruce considers it the surest sedative with which to combat the cerebral excitement of delirium tremens and acute mania.

Hyoscyamine.—From *Scopolia carniolica*, W. R. Dunston and A. E. Chaston⁷⁴⁴ have extracted hyoscyamine and a mere trace of hyoscine. The rhizome contains 5 per cent. of the drug alkaloid. The plant also appeared to yield a crystalline body resembling dextrose, a fluorescent substance, and cholesterol, this latter to the extent of 1 per cent. According to Lauder Brunton and Dyce Duckworth, scopolia has properties resembling those of belladonna, but does not produce dryness of throat and dilatation of pupil. It was found efficacious, in the form of liniment, in reducing pain and swelling in rheumatism.

Hypiodous Acid.—It has been found that the hypiodites are more stable preparations than the hypochlorites, containing as they do a relatively smaller proportion of oxygen. Keeping this in view, H. Woods² has prepared and examined the hypiodites of calcium, potassium, and sodium, and found it to be of value in practical medicine. The calcium hypiodite especially is an excellent and almost tasteless preparation for internal administration. The potassium hypiodite is a useful antiseptic and parasiticide; it is the liquor potassæ iodinatæ, containing 28 grains (1.83 grammes) of iodine to the ounce (32 grammes). This can also be given internally in doses of from 5 to 10 minims (0.33 to 0.67 gramme) properly diluted. Equal parts of liq. potas. iodinat. and olive-oil

make a soapy liniment superior, according to Woods, to the "linim. potas. iodidi cum sapone" of the British Pharmacopœia.

Hypnal.—This new substance which has been chemically studied by Reuter⁷⁴⁴, consists of about 45 per cent. of chloral and 55 of antipyrin. It has neither taste nor odor, but is less soluble in water than chloral. It melts at 58° to 60° C. (136.4° to 140° F.) and is chemically the trichloraldehydphenyldimethylpyeazolon, or hypnal. Bardet,²⁹⁰ who has used it with success in 22 cases of insomnia in 1-gramme (15 grains) doses, considers it a powerful hypnotic. It is especially valuable in delaying spasmodic conditions, such as cough.

Hypnone.—According to L. R. Regnier,⁸⁴⁵ hypnone or acetophenone was first brought into notice as possessing hypnotic properties by Dujardin-Beaumetz and Bardet in a communication to the French Academy. Connolly Norman considers it particularly active in cases of insomnia due to cerebral excitement, in which sleep is brought on under its use. Subcutaneous injections were not followed by bad effects. On the other hand, Huchard and Labbé think that the action of acetophenone in cases of insomnia is not absolutely constant. Mairet and Combemale, of Bordeaux, assert that hypnone does not produce sleep in normal animals; these results being concordant with those of Grasset, Laborde, and Huchard. In order to produce sleep in animals, Laborde employed toxic doses, which were followed by paralytic phenomena. On the whole, acetophenone has rendered no satisfactory results, and it has, further, the great inconvenience of profoundly modifying nutrition and notably diminishing the hæmoglobin of the blood.

Kamensky^{590 24} has arrived at the following conclusions: (1) hypnone enfeebles sensibility and diminishes the reflexes; (2) moderate or large doses produce a slight sleep resembling natural sleep when the drug is introduced directly into the blood; (3) it increases the cardiac beat, probably by stimulating the accelerator centre of the heart; (4) in moderate quantities it increases respiration, but large doses paralyze it; (5) it depresses arterial pressure by paralysis of the vasomotor centre and enfeeblement of the heart's energy; (6) moderate and large doses diminish the excitability of the cerebrum, while all quantities increase the excitability of the spinal cord; (7) it reduces the oxyhæmoglobin of the blood; (8) it diminishes temperature by increasing heat dissipation. From

the observations of various practitioners, W. H. Flint concludes that hypnone is a very uncertain hypnotic, being used, in the absence of better drugs, in certain cases of primary and nervous insomnia. It is contra-indicated in sleeplessness from cough and in patients with feeble stomach. It has been given in doses of from 3 to $7\frac{1}{2}$ grains (0.20 to 0.50 grammes), in capsules or almond-oil. Flint himself has abandoned the use of the drug, owing to its uncertainty of action. The tolerance of the remedy was soon established, so that larger doses were required after the beginning of treatment.

Hypnotism.—In the ANNUAL of last year appeared a rather detailed account of the progress of hypnotism. No less interest has been taken by writers on this subject during the past year, but much which has been written is merely a repetition of the work there given. In the hands of able experimentalists and general practitioners, hypnotism has been extensively employed of late, partially in the study of its phenomena and more largely, perhaps, in the treatment of disease. The disorders benefited by hypnotism have been widely different in character, but more decided beneficial effects have been produced in affections of the nervous system. The enthusiasm displayed by all classes of practitioners and in all departments of medicine has been certainly very great. Indeed, the fear has been expressed by many that hypnotism may substitute all other medical measures and therapeutic agents heretofore in vogue and become a general panacea. The subject has of late so persistently occupied the most scientific minds, on the one hand, and has been so abused by certain classes outside the domain of science and conscientious investigation, that doubts begin to be entertained even by men of unquestioned medical authority as to the therapeutic value of hypnotism. In other words, "we are passing at this present moment," as some one has fitly expressed it, "through a mental epidemic which may be called the epidemic of hypnotism, just as common epidemics and fashions in dress have their seasons of development,—of full growth and decline; then, after a period during which they sleep (for they are not dead), they rise again and appear as active as ever."

What the final results will be of the present widely-spread enthusiasm over the value of hypnotic suggestion in the treatment

of disease cannot, of course, be accurately foretold ; but certain it is that hypnotism has arrived at a critical stage, when its therapeutic value—nay, its very phenomena—should be carefully investigated by unbiased scientific men. It is only in this manner that hypnotism—which, it cannot be gainsaid, has given rise to “magnetic physicians,” “clairvoyant physicians,” “mental healers,” “Christian scientists,” quacks, charlatans, and what not—can be purged of such mysticism, exaggeration, and fabrication, and given, if it so deserves, its true place in therapeutics.

In this connection we are glad to see that the British Medical Association has given the matter its due importance, appointing a special committee, composed of the ablest men of well-deserved reputation in the medical world, whose chief object it shall be to make a full investigation of the subject. Their report is anxiously awaited.

In a very interesting and valuable paper read before the Boston Society for Medical Improvement, Hamilton Osgood⁸⁹, gives an excellent historical sketch of hypnotism and reports his results in 35 cases successfully treated by suggestion, including rheumatism, dyspepsia, insomnia, neuralgia, acute bronchitis, sore throat, hoarseness, constipation, painful haemorrhoids, chronic headache, menstrual derangements, intemperance, paralysis of tongue, sciatica, mental depression, weakness, loss of appetite, chronic hysteria, torticollis, functional paraplegia, and ataxia. All of them, with a single exception, were greatly improved, some completely cured. After the interesting discussion which followed the reading of the paper, Osgood closed by saying that he has never seen the slightest ill results from hypnotism in the hundreds of times that he has employed the method ; that all objections made to the suggestive treatment are made by those who know nothing about it ; that the Nancy school of hypnotism seeks to relieve suffering, but that the Charcot school does little or nothing in this direction ; that, unless his judgment be the result of a careful trial upon patients, no physician has a logical right to object to the use of hypnotism ; that, without personal and technical knowledge, he cannot be intelligent in regard to this means of relief.

It has been asserted that hibernal sleep in mammals is a hypnotic phenomenon, and that by artificially reducing the temperature of the body a warm-blooded animal can be converted into a

cold-blooded one, and made to fall into a hibernal sleep. On the return of sensibility to cold there is an increase in the production of heat, reflexly, and thus the animal, resuming the physiological temperature, is freed from the hibernal sleep. This consideration led M. J. Marie¹, to perform a series of hypnotic experiments which proved successful on men, but not on animals. The results show a decided influence of suggested loss of sensibility to cold and heat on the physiological temperature. In one case the sub-lingual temperature is recorded to have been at 8.30 A.M., 37.1° C. (99° F.); after suggestion it fell, and when taken at 8.30 P.M. it was only 34.5° C. (93.9° F.). In the second case the temperature, normally, was 37° C. (99° F.) at 8.30 A.M. After suggestion, at 8.30 P.M., it was 35.5° C. (95.9° F.). In both cases all unpleasant symptoms subsided and the temperature returned to normal, after the restitution of sensibility to cold. The phenomenon is thought to be due to loss of sensibility to cold, brought about by hypnotic suggestion, in which there is an increase in heat dissipation and a diminution of heat production, until the regulation of temperature is disturbed. Hence, Marie and Hellich, basing their opinion on results of the experiments so far performed, believe that the influence of suggestion is not limited to the functions of volition and consciousness, and that such an influence is *not*, as Bernheim has stated, purely psychical; and it is put forward as a proved fact that the hibernal sleep is a hypnotic phenomenon in which the animal loses sensibility to cold, and that men, too, by losing sensibility to temperature, fall into hibernal sleep or apparent death.

At the annual meeting of the British Medical Association, held in Birmingham on July 31 and August 1, papers were read (Section of Psychology) by Norman Kerr, of London, and G. C. Kingsbury, of Blackpool. Practical demonstrations on two gentlemen were given, and the results so impressed the minds of those assembled that one of the most interesting and scientific discussions of the subject soon followed, in which decided opinions were expressed on both sides of the question. Kerr strongly objected even to the discussion of the matter, considered the prominence given to hypnotism of late as a sort of neurotic epidemic, deprecated its use as producing serious results, and hoped the profession would set its face against the whole practice.

Kingsbury, on the contrary, reported cases which he asserted

to have been cured by hypnotic treatment, and his assertions were practically supported by the demonstrations performed before the Association,—demonstrations spoken of and characterized by Gairdner as “honest, genuine, and likely to do good.” The chief objections presented by Kerr were as follow: 1. That only a limited number of persons were susceptible. 2. That the after-effect was a mental disturbance, a dissipation of energy, and a nerve exhaustion, a frequent repetition being apt to cause deterioration of brain- and nerve- function, intellectual decadence, and moral perversion. 3. That hypnosis is a departure from health—a disease. 4. That hypnosis is a true narcosis, embracing the lethargic, cataleptic, and somnambulistic states. 5. That, though suffering was sometimes temporarily assuaged, the underlying disease was not necessarily cured; for by hypnotic anæsthesia, though evanescent oblivion might be secured, the lethal power of the morbid disorder—of which the pain was a merciful, if unwelcome messenger—was in most cases increased. 6. That the dangers of hypnotism were very great, as each *séance* might bring the hypnotic more under the control of the hypnotist, ending often in the complete submission of the former to the will of the latter; in this connection he reported the case of a patient of a high-minded medical hypnotist, precipitated into an asylum by the consequent nerve disorder. 7. That an electric, subtle affectivity, ending in disaster, might develop between operator and operated upon. 8. That in the lethargic and cataleptic states criminal assaults had been committed by medical men, who had been convicted and punished; in the somnambulistic state subjects had been compelled to commit crime, and so serious were these evils that French surgeons had been prohibited from practicing hypnotism in the army or navy; Belgian surgeons also. 9. That it was not desirable that the control of any one’s thoughts and actions should be in the keeping of a fallible fellow-mortal. In this connection he spoke of the abuse of chloroform and that of hypnotism, saying that there was no comparison, as held by some. Chloroform had only a limited material influence, but a hypnotizer had versatile powers of cunning and ingenuity in the obtaining and modifying of the hypnotic process as affecting brain-function. Other opinions in *pro* and *con* were expressed, bearing upon the subject, and, finally, Kingsbury closed by saying that the hypnotic condition was not, as maintained by Kerr, a

disordered cerebral state; that it was quite possible to cure inebriety by simple hypnotic suggestion; that in inducing this hypnotic sleep there was no special affinity between the subject and the operator, and that the state could be induced by any fairly intelligent person; that not only functional disorders, but even organic diseases were amenable to hypnotic suggestion. On the whole, never before have the leading facts of hypnotism been so honestly, faithfully, and scientifically discussed; and such deep interest was aroused on the subject that a committee of medical men was immediately appointed to consider it further, with the object of endeavoring to ascertain the true nature of its phenomena, and the propriety, or otherwise, and the value of its use in the treatment of disease. The committee appointed consists of the following well-known medical men: Needham, President; Gairdner, of Glasgow; Broadbent, London; Drummond, Newcastle-on-Tyne; Ross, Manchester; Suckling, Birmingham; Clouston, Edinburgh; Yellowlees, Glasgow; Hack Tuke, London; Connolly Norman, Dublin; Kingsbury, Blackpool; T. Otterson Wood, London, as Secretary. From such a committee an interesting report upon one of the most important of modern medical topics may certainly be expected.

Benno von Steinmetz,⁸² reports 11 cases treated by hypnotic suggestion, in which most satisfactory results were obtained, as follows: 1. Boy 11 years of age, with painful enlargement of liver and diarrhoea, cured of both troubles in a single *séance* each. 2. Girl 8 years of age, with pain in the stomach, with diarrhoea, nausea and headache, cured in two hypnotizations. 3. A 37-year-old woman, with tic douloureux involving the supra-orbital, the infra-orbital, and inferior dental nerves, and of four years' standing, cured after few treatments. 4. Man, colored, 37 years of age, with intercostal neuralgia, cured in two *séances*. 5. Boy; teeth extracted without pain under hypnotic suggestion. 6. Man, with excruciating pain in shoulder and arm, due to contusions accidentally received, cured after a single hypnotization. 7. Seventeen-year-old girl, with neuralgia of back in the region of the ovaries, cured in a single *séance*. 8. Young man 28 years old; wound sewed without the least pain under hypnotic suggestion. 9. Girl 13 years old; toothache; cured after a single *séance*. 10. Young man 28 years of age; alcoholic insomnia; cured in one treatment. 11. Young man 25 years old; wounds sewed under hypnotized

condition, without slightest pain. Edward L. Wood,⁵⁹ details the case of a patient who, under the influence of hypnotism, was operated upon with the most satisfactory results. It was a case of osteomyelitis in the upper third of the humerus, and required a painful surgical operation. Three days before the operation the patient was hypnotized six times, and was very well under control by the proper time. On the day appointed the patient was hypnotized in his own bed and then carried to the operating-room. The work was done under thorough antiseptic precautions, all the fistulæ being explored, scraped, and washed out, etc., after which the proper dressings were made with perfect ease, as the patients, still under the hypnotic state, could turn from side to side, move about, or sit up, as he was directed. He was carried to bed at 9.50 A.M., and told that at 12 o'clock he could sit up and have something to eat; the nurses, meanwhile, being cautioned not to disturb him. At 12 o'clock patient sat up in bed, stretched his well arm, and said: "Doctor said that I could have something to eat at 12 o'clock."

Nikolai M. Mandelstamen²⁰⁰ reports 2 remarkable cases of neurotic affections successfully treated by hypnotic suggestion. The first was that of a girl 21 years of age, of healthy family, who had obstinate vomiting, habitual constipation, with only a stool every two or three weeks, headache, and epigastric pain. The trouble was of about a year and a half standing. Drugs, mineral waters, electricity, washing out the stomach, had done no good. There was no organic disease of any kind and the only signs present were slightly-exaggerated tendon reflexes and two tender points on the left side of the chest. Mandelstamen threw the girl into the hypnotic state and suggested that a cupful of milk be taken and retained in the stomach. On the next day vomiting had ceased. After a second *séance* vomiting occurred once in nineteen days, but subsequently the patient continued well for three and a half months. The symptoms again began, but after another hypnosis they entirely disappeared. The second case was that of a highly hysterical girl, 20 years old, who for twelve years had incontinence of urine, sleeplessness, tremor of limbs, headache, dysmenorrhœa, abdominal pain, inability to walk, and other nervous symptoms. No treatment had been of any avail. In the first *séance* she was told to sleep well and retain her urine, which she

did as suggested. In the second hypnotization she was advised to walk well and that her pain in the abdomen would disappear. The results were satisfactory. The headache and tremors were removed after a third *séance*, and after several days no relapse had taken place. In a conservative article Charles H. Harwood⁸⁰ holds that hypnotism is a dangerous therapeutic measure. According to Sperling, its present position in scientific medicine in Germany is by no means sure or recognized. Voisin has recently expressed the opinion that it is difficult of application and an untrustworthy means of treatment. Many other reputable physicians regard with disfavor, for strong and scientific reasons, the promiscuous use of hypnotism. It is, therefore, dangerous, Harwood believes, for young practitioners to practice it.

Schrenck-Notzing⁸¹ has observed a cure of sexual perversion by suggestion. The patient, aged 28 years, never had experienced sexual excitement with females, but was only gratified by mutual masturbation with the male sex. Forty-five treatments by suggestion, in the course of three months, completed a change in the abnormal sexual appetite, and a few months later the patient was happily married. A young hysterical woman who suffered from cephalalgia and pain in the arms was relieved entirely in one *séance*; another woman, 63 years of age, who had suffered from severe rheumatic pains for two years, was cured in twelve *séances*. Both cases are described by L. Bentzon.⁸⁷⁵ G. Lütken⁸⁷⁵ reports 13 cases treated by hypnotism, of which 11 were cured and 2 improved. Of those improved one was a case of paresis and the other a case of nervous derangement following an attack of apoplexy. The cases cured were as follow: 1. Hypochondriasis in a man, cured in nine *séances*. 2. Neuralgia of lingual and œsophageal nerves in a woman. 3. Hypochondriasis, three *séances*. 4. Chorea in a 10-year-old girl, five *séances*. 5. Stammering in a man, ten *séances*. 6. Chorea and Onanism in a girl 11 years old, fifteen *séances*. 7. "Morbus mentalis" in a woman, three *séances*. 8. Neurasthenia in a woman. 9. Hysteria with enuresis and pain in legs, sixteen *séances*. 10. Melancholia in a woman of 41, who had twice attempted suicide, six *séances*. 11. Another case of stammering in a young man. Hypnotism has been tried by S. Hytten⁸⁷⁵ in a number of cases of nervous disorder with satisfactory results. Ten cases were treated, of which

2 were improved and 8 cured. Of the two improved one was cephalalgia of many years' duration in a woman 27 years of age; the disorder ceased for some months after a single treatment; the other was that of a girl 13 years of age, who was "shy, tired of home, and evil-tempered," but who was relieved in six *séances*. The cases cured were: 1. Hysterical paralysis in a 14-year-old girl, in a few hypnotizations. 2. Hysteria in a girl 16 years old. 3. Sciatica in a woman 26 years old, after four treatments. 4. Cephalalgia and rachialgia. 5. Hysterical hemiplegia, in three *séances*. 6. Sciatica, in five hypnotizations. 7. Stammering in a young man. 8. A case of a woman who, under suggestion, had a tooth extracted without pain.

Two cases of cure by hypnotism, *without* suggestion, are graphically described by H. C. Wood.⁶ One of the cases was that of a woman suffering from tremors simulating *paralysis agitans*, who was entirely relieved after four treatments. The other, also a woman, was one of paraplegia, of a hysterical nature; eight hypnotizations were sufficient to almost control the disease, although after the last *séance* the knee-jerks had not returned. Although not proposing to commit himself to any theory as to the method in which hypnosis produces cure, Wood does not, as yet, see why all the effects obtained cannot be accounted for by the theory of mental influence. The hypnotic influence has been tried even in the phenomenon of somnambulism with satisfactory results. Leteur⁷⁶⁰₇₆₁ asserts that he has effected a cure in several cases. In some the habit stopped at once; in others it became gradually less frequent, until it ceased completely. After treatment it was not resumed. Germain Sée⁸⁰₈₁ recently arrived at the conclusion that hypnotism is apt to produce evil effects on the organism, and that it especially favors and develops tendencies to hysteria. As hysteria is a disease in which the higher cerebral activities are suspended, and as such a phenomenon is the leading and essential characteristic of the hypnotic state, the ultimate results are manifest. Sée is likewise opposed to the practice of hypnotizing children, and Gilles-de-la-Tourette maintains that those hysterically predisposed are almost certainly made hysterical by frequent hypnotization; that the hypnotic treatment in alleged cures of paralysis or a contracture only locates the disease somewhere else in the body, or it is substituted by convulsions.

Andrew McFarlane⁹⁹ is opposed to the too extensive use of hypnotism. Unlike therapeutic agents, which may do physical and temporary harm, hypnotism may produce weakness, and even deterioration of mental power,—a condition that may be followed by an irremediable and permanent injury, as in the case of the hysterical girl referred to by Bernheim, who was ultimately transferred to an insane-asylum as the result of too frequent hypnotizations.

Hypophosphites.—The hypophosphites are recognized universally as most valuable remedies in wasting diseases, their only objection being the frequent impurities which they contain. Wilcox¹⁰⁰ has proposed a new preparation that appears to have given excellent results in pulmonary affections. He claims for it a decided efficacy in every respect. It has become known as Wilcox's hypophosphites, and its formula is as follows:—

R. Syrupi sodii et calcii hypophosphitis, 3iiss (108.86 grammes).

Acidi phosphorici diluti, ferri pyrophosphatis, 2a 3ss (16.00 grammes).

M. Sig.: One teaspoonful in a wineglass of water three times daily after meals.

Ichthyol.—Nils Gadde¹¹⁶ reports several cases treated with ichthyol in which satisfactory results were obtained. The drug was of decided benefit in both acute and chronic urticaria, and also in chronic alcoholism, in which the tremor rapidly disappeared, the appetite returned, and sleep became normal and undisturbed. In one case the tremor disappeared in ten days. The depression and chronic gastric catarrh were likewise greatly diminished by the drug. Good results were also observed in chronic rheumatism, administered internally, and with local applications. In arthritis deformans the pain was greatly lessened. In a case of diabetes the sugar was reduced from 6 per cent. to $\frac{1}{2}$ per cent. in the course of a month, the diet being regulated in connection with the administration of the drug. The doses were not stated. H. W. Freund¹¹⁷, has employed ichthyol in diseases of women, bearing in mind the effects of the drug, when locally applied, in cases of inflammation and pain. The diseases treated were chronic parametritis, chronic and subacute perimetritis, with exudations and formation of cicatricial bands; vaginal cicatrices, as well as those of the vaginal portion of the uterus; chronic metritis, inflammations of the ovaries, the tubes, and surrounding tissues; erosions of the cervix, and pruritus of external genitals. The results were very rapid and complete. The remedy was employed both ex-

ternally and internally. Internally it was given, in pill form, from 1 to $1\frac{1}{2}$ grains (0.07 to 0.10 gramme), thrice daily, at the beginning, the dose being afterward increased. Externally the following formula was used:—

R Amm. sulpho-ichthyoli, 3ij (8 grammes).
Glycerini, f3ij (96 grammes)
M. Sig.: To be applied upon vaginal tampons.

An ointment was also employed,—lanolin and ichthyoil, equal parts,—or as a soap, applied to abdominal walls. A suppository, 1 grain (0.07 gramme) of the drug to 2 grains (0.13 gramme) of cocoa-butter, was likewise used. In all cases the odor of the drug may be disguised by cumarin. In cervical erosions the pure drug was best applied locally. In pruritus an ointment or a 10-per-cent. watery solution was used locally. Given internally, it seemed to improve the general condition, increasing the appetite and regulating digestion and action of bowels. The drug did not alter secretion of urine, nor did it cause untoward after-effects. It was well tolerated. The absorbent action of the remedy was most prominent. Thick cicatricial bands were made to disappear, in 2 cases, in a few days. Parametritic cicatrices became thin. An extensive exudate of Douglas's *cul-de-sac*, with slight rise of temperature in one case, disappeared in sixteen days. Ichthyoil gave astonishingly good results in a case of gonorrhœic salpingitis that had resisted all other treatments. The drug effected a cure in a few days, producing a copious mucous discharge from the genitals. In the same case the intestinal catarrh was removed by ichthyoil suppositories. The drug produced no disagreeable action on the mucous membrane of the skin. In great sensitiveness of the part the ichthyoil treatment was followed by the application of a 2- to 5- per-cent. solution of chloral-glycerin with good results.

Illicium Parviflorum.—E. Barral³⁵ asserts that he has isolated a poisonous glucoside from the kernel, not from the pericarp, of the *Illicium parviflorum*. A decoction from the seeds produces gastric irritation and vomiting, followed by paralysis, anaesthesia, convulsions, and death, if the dose be sufficiently large. The plant belongs to the same genus as the *I. Floridanum* of this country and the *I. religiosum*, or *Shikimi*, of India. The Chinese species, as is well known, produces the oil of anise of commerce. The oil of shikimi contains an excessively poisonous alkaline principle,

which is used in India for criminal purposes. It causes violent epileptiform convulsions, with cyanosis and death. As stated by Barral, the glucoside of the *parviflorum* possesses similar highly poisonous properties.

Indigo-Powder.—Montagnon²²⁸ has treated a case of ingrowing toe-nail with indigo-powder, as suggested by Chaussignat in 1887. The first author claims that the pathological condition depends upon a disease of the soft parts, and not a fault of the nail. Upon this theory, indigo, which is astringent and tonic, so modifies the tissues as to produce cicatrization. The case observed was of seven years' standing and had resisted all other treatments. The nail being raised by means of fine threads of lint, the powdered indigo was applied to the ulcerated surface. The results appeared satisfactory.

Iodine—Iodides.—Augustus A. Eshner¹⁹ reports a case of a syphilitic man taking 170 grains (11.33 grammes) of potassium iodide three times a day. A single dose of 440 grains (30 grammes) being inadvertently given, vomiting and pain in the epigastrium were produced. Very little attention appears to be given to one of the untoward after-effects, certainly the most dangerous of all, namely, œdema of the glottis. A. Groenouw¹¹⁶ has collected 9 cases, two of which occurred in his own private practice, which show that in rare cases the internal use of iodide of potassium may suddenly produce such intense œdema of the glottis as to render necessary the immediate performance of tracheotomy. In some cases the œdema is so severe as to produce death, although in others it may disappear as rapidly as it occurs. In the cases collected it was shown that the untoward consequence may occur soon after the injection of the drug, and even after small doses. Four cases presented the œdema on the first day, 1 under a dose of 15 grains (1 gramme), 2 under $7\frac{1}{2}$ grains (0.50 gramme), and the fourth under as small a dose as 3 grains (0.20 gramme). Three cases showed the symptoms on the second and the eighth on the sixth day, after doses varying from 30 to 195 grains (2 to 11 grammes). It was observed, where œdema occurred, that all other symptoms of iodism were absent, and, further, that age and sex had no influence; that it appeared in otherwise perfectly healthy individuals, and that after the disappearance of the œdema persistence in the use of the drug produced no unfavorable after-effects; so that iodism,

it appears, is not a permanent symptom. The most important point gleaned from these cases is that œdema of the glottis, fatal in a few minutes if not relieved promptly, may supervene on the early administration of the drug, and that the longer the salt is used, the less danger is there of œdema; so that if a patient has taken from 50 to 100 grains (3.30 to 6.65 grammes), and has not exhibited untoward symptoms, the danger from œdema of the glottis is greatly lessened.

Nineteen cases of vomiting from various disorders have been successfully treated under Roque,¹⁷ ~~Dec. 10, 1888~~ with the internal use of tincture of iodine. Eleven were phthisical patients, in whom, especially when they are not too far advanced, tincture of iodine is of great service. It was also useful in those suffering from dyspepsia in the early stages of tuberculosis. The attacks of vomiting were reduced in frequency or altogether aborted. The drug was well borne, and its ingestion was followed by a sensation of warmth in the stomach. It was generally administered in water, 10 drops in 4 ounces (128 grammes) of the liquid, to be taken in three portions after meals. Owing to idiosyncrasy, the drug was followed in some cases by marked symptoms of iodism, which, however, rapidly disappeared on discontinuing its use. At the Hôtel Dieu, of Lyons,¹⁰⁰ the following prescription has been used almost daily in injections for varicose veins:—

R	Iodine,	.	.	.	.	.	.	.	.	.	.	1 part.
	Tannin,	.	.	.	.	.	.	.	.	.	.	2 parts.
	Water,	.	.	.	.	.	.	.	.	.	.	200 parts.

M. Sig.: Iodo-tannin solution.

The injection should consist of a few drops, and the patient kept absolutely quiet for a fortnight. A remarkable case of acute poisoning by the external use of iodine is reported by George Thomas Jackson.⁵⁰ The patient, a very fat woman 50 years of age, entered the hospital to be treated for an eruption that was evidently already subsiding. The woman stated that three days before applying for admission she had a pain in the right of the abdomen, for relief of which she had rubbed into her side "half of 5 cents' worth of iodine." This was done at 9 o'clock in the evening. At 1 o'clock she awoke with a feeling of great nausea, and vomited, six or seven times, a yellow fluid that was very acid and burnt her throat. In the morning she found a good deal of red-

ness in her right arm and a large blister upon it. In twenty-four hours the dermatitis had involved the face, neck, shoulders, left arm, and appeared in patches on the trunk; then bullæ appeared upon the legs, and in this condition she entered the hospital. The face was then somewhat swollen, and a yellowish-green crust was observed on the right forearm. The tongue was greatly swollen, red, and glazed. The patient complained of a feeling of prostration, of great burning and discomfort in the skin, of complete anorexia and pain, and burning at all attempts at deglutition. She also said that her stomach and throat felt raw. Her digestion was very much disturbed. Placed under general treatment, she was discharged within three weeks in good health. As the patient positively denied having swallowed the drug, the case may be looked upon as a remarkable instance of idiosyncrasy toward iodine. O. S. Runnels¹⁸², considers it malpractice not to employ iodoform, iodine, and iodized phenol, as the case may be, in local treatment of certain pelvic affections. Such agents ought to be looked upon as of the greatest value in the treatment of the *sequelæ* of inflammations in those active states such as hyperplasias, effusions, enlargements, and all abnormal cell activities, and even in those more dormant conditions known as subinvolutions, chronic congestions, adhesions, and indurations. Owing to the very penetrating alterative action of these three agents, nothing has been found better to stimulate resolution in such conditions, and of the substances mentioned the iodized phenol has the preference.

Iodoform.—In a 10-per-cent. oil-emulsion or in the form of a mixture with water, iodoform has been injected directly into the joints in cases of tuberculous disease. The injection is made every eight days. Krause, of Halle,⁸⁰, removes the discharges, washes the joint with a solution of boracic acid, and then injects the iodoform-water; he further recommends the employment of massage and motion. Trendelenburg has made the same application in cases of tubercular pleurisy, and even in phthisis. Here the injection was made into the lower lobe, the seat of the disease, and, although no final results were observed, the use of the drug was followed by no bad results. In the cases of joint disease results were satisfactory, since the cures were complete and permanent. Burlureaux²², gives the details of a case of scarlatiniform eruption, evidently produced by the use of iodoform in the treatment of a

wound. The patient, who complained of a disagreeable taste, was made to place in his mouth a piece of silver, and immediately a garlic taste was experienced, which, according to Poncet, is characteristic of iodoform. Some of the saliva was then mixed with calomel, and a canary-yellow was produced, owing to the formation of the iodide of mercury. Both signs Burlureaux believes could be used in determining intoxication by iodoform or iodide of potassium. Arch. Dixon¹³⁸ opposes the conclusions arrived at by Van Arsdale in regard to the uses of iodoform, and states that he has used it for a period of five years as a surgical dressing, almost to the exclusion of every other agent. In wounds of every character, both within and without the cavities of the body, he has relied upon it and it has served him well. It has failed in no case, and he ventures to affirm that, for rendering wounds aseptic, for minimizing the secretions, for deodorizing and preventing the exuberant growth of granulations in wounds, iodoform has no equal. E. Haffter²¹⁴ states that a saturated solution of camphor in olive-oil may dissolve as much as 6 per cent. of iodoform. This solution may be conveniently employed for parenchymatous and intra-ocular injections of the drug. A writer⁹⁰⁸_{n. 17} has pointed out that ethylic alcohol saturated with camphor can dissolve eight times as much of iodoform as the pure alcohol.

Iodol.—Waugh⁷⁰⁰ has seen immediate relief following the use of iodol in a case of chronic diarrhoea of the nervous type, and of several years' standing. It was observed that whenever the diarrhoea was worse fissures of the anus appeared. The condition was entirely checked by the local application of the remedy in the form of an ointment, 1 part to 16. David Cerna⁹ reports several cases treated with iodol, locally and internally, in which the most excellent results were obtained. Four of the cases were of syphilitic and 1 of tuberculous nature, in which ulcers were the most prominent local manifestations. The internal and external use of the remedy, conjointly, appeared to produce the most satisfactory effects. The employment of iodoform by Moleschott in 1882, in the treatment of diabetes mellitus, suggested to the author the internal use of iodol in the same affection. In the case reported benefit was noticed in a month, and complete cure in two months, under a dose of 6 grains (0.40 gramme) daily of iodol and an exclusive milk diet. Generally the amount of iodol administered

internally was from 6 to 20 grains (0.40 to 1.30 grammes) a day. For local application solutions were made in alcohol (1 part to 3) or ether (1 to 4); as an ointment, in from 1 to 4 or 5 of vaseline. On the whole, Cerna recommends the use of iodol especially in those syphilitic cases, even of the worst type, which, owing to idiosyncrasies or other causes, will not bear the continuous use of mercury and iodide of potassium.

Iodosulphate of Cinchonine.—The iodosulphate of cinchonine, obtained by the action of iodated iodide of potassium upon a watery solution of the sulphate of cinchonine (25 parts of the salt to 2000 of water), contains 50 per cent. of iodine, and is a very light powder of brownish color, inodorous, insoluble in water, but soluble in alcohol and chloroform. It has been employed instead of iodoform, and is said to have been found to be as efficacious as this drug.

Iron.—Under the name of the “Three Chlorides Elixir,” a preparation has been placed upon the market, each fluidrachm (4 grammes) of which contains $\frac{1}{2}$ grain (0.008 gramme) of protocloride of iron, $\frac{1}{25}$ grain (0.0005 gramme) of bichloride of mercury, $\frac{1}{25}$ grain (0.00028 gramme) of arsenic, with tinct. calisaya and aromatics. I. N. Love⁶⁶⁸ asserts that he has used this elixir in over 300 recorded cases of blood diseases with satisfactory results. It is generally held that iron introduced into the economy in uncombined form is again eliminated without being used, even though it passes through the circulation; and that it is only assimilated, and replaces the constant waste of the tissues, when taken in organic combinations such as occur in food-stuffs. It is true, however, that iron by itself, is able to relieve anæmia, especially chlorosis, in cases chiefly where there is not only the want of red blood-corpuscles, but also of haemoglobin. In order to clear up these facts, Francesco Cappola⁶⁶⁹, undertook a series of experiments on full-grown and healthy chickens, since in birds the circulation, the respiration, and heat production are more active, and on that account tissue changes more rapid, and because their red blood-cells are better adapted to accurate and more complete examinations than those of mammalia. From such studies on chickens, Cappola draws the following conclusions: 1. The lowered amount of haemoglobin and the histological changes of the blood depend not upon the condition of the food, but simply upon the want of iron, since with this one cannot only avoid, but also improve, such con-

ditions. 2. Iron given in a form uncombined with organic material is taken up and assimilated by the animal organism. This view is justified not only by the increase of haemoglobin, but also by the fact that the iron thus administered is used up in proportion to the amount previously withdrawn, and that this ceases as soon as the organism has again obtained its full amount of iron: C. B. Gillespie,¹⁰⁷ believes bromide of iron to be one of the best preparations for internal administration, as it is easily and quickly assimilated. He has found it especially valuable, as a topical application, in fetid discharges and gangrenous ulcers. He has never seen it fail in erysipelas, where it acts as a specific. In such cases it must be freely used, painted over and beyond the infected integument. The following formula has been employed for the preparation of the salt: Bromide, 1 pound (500 grammes); water, 4 pints (2 litres); iron, in the shape of nails, 3 ounces and 2 drachms (104 grammes). With one-third or one-half of glycerin it makes a permanent glyceride for internal use, which ought only to be mixed with water when dispensed. The dose of the sal bromide of iron is 10 drops of the glyceride, 20 to 30 drops in sweetened water. It is a well-recognized fact that erysipelas is essentially a constitutional disease, with a more or less self-limited local manifestation, and that it depends upon the presence of the streptococci erysipelatosi described by Fehleisen, of Berlin, in 1883; that these microbes, according to their discoverer, if left alone in the blood, will not die until they have attacked the tissues, making them give up their oxygen. J. A. Crisler⁷⁴ propounds the theory that iron takes into the blood the oxygen required, which, coming in direct contact with the streptococci, causes their destruction. He further believes that if iron be given first, last, and all the time in this disease, and the patient placed in an aerated chamber where oxygen may be generated, the records would show a considerable decrease in mortality from erysipelas and kindred affections.

Jambul.—Egasse,⁶⁷ reviews the literature of this new therapeutic agent, to which some attention has of late been given. It is a tree that grows in most tropical climates, and belongs to the *Myrtacea*, and is the *Eugenia jambolana* of Lamk or the *Syzygium jambolana* of De Candalle. From the fruits, by alcoholic fermentation, a liquor is obtained, *jambava* of the Hindoos. This liquor, allowed to acidify, turns into a vinegar, of an agree-

able taste, which has been used by the laity as a stomachic, carminative, and diuretic. The juice of the fresh bark, mixed with goats' milk, is said to be used in the treatment of infantile diarrhoea. It has also been used as an astringent in the form of gargles and lotions. The plant has been especially extolled in the treatment of diabetes. Its properties are principally in the seeds, which, according to the latest analyses, especially that of Elborne, contain essential oil, chlorophyl, resin, gallic acid, albumen, coloring extracts, and an insoluble residue. These grains appear to contain an active principle, a glucoside, to which the physiological effects of the plant are due, but which, as yet, has not been isolated. The natives of India and the English physicians were the first to speak in favor of jambul as a remedy for diabetes mellitus. The experiments of Lascelles Scott, T. A. E. Balfour, and G. Sims Woodhead show that jambul has the power to stop, in a marked degree, the conversion of starch into sugar, and that this action increases proportionately to the quantity of the drug used. Von Mehring had previously shown that *phloridzin*, a glucoside extracted from the apple-tree, the pear-tree, and other plants, had the power of producing sugar in the urine of animals. Groeser instituted a series of experiments upon animals, and administered phloridzin to dogs in the proportion of 1 gramme (15 grains) per kilo ($2\frac{1}{2}$ pounds) of body-weight, and was able to produce a considerable amount of glycosuria, which persisted from twenty-four to thirty-nine hours. It was also found that phloridzin caused diarrhoea. Assured of the effects of this glucoside, the experimenter then submitted the dogs to the conjoined action of phloridzin and the extract of jambul, and found that under such circumstances the sugar of the urine was invariably diminished almost to one-half of that secreted under the action of the phloridzin alone, and also that the duration of the glycosuria was considerably lessened. In pushing his experiments in order to determine the toxicity of jambul, Groeser noticed that as many as 18 grammes (5 drachms) of the drug could be given in a day without producing in the dog any deleterious effects, with the exception of some diarrhoea. Following the results of these experiments, clinicians have employed jambul, with varying success, in the treatment of diabetes in man. Egasse concludes, in a general way, that the drug can apparently do good only in the mild forms of diabetes, but in which kind of diabetes

it will do the most good has not as yet been determined. The facts so far collected point to the insipidus form. The drug has been employed mostly in the form of powder. The minimum dose may be set down as from 30 to 50 centigrammes ($4\frac{1}{2}$ to $7\frac{1}{2}$ grains), repeated three or four times a day, but it can be increased to even 3 or 6 grammes ($\frac{3}{4}$ or $1\frac{1}{2}$ drachms) in the twenty-four hours, according to the requirements of the individual cases. Among those who have reported favorably on its use in the past few years are Allen,²⁰² Hemminger,²⁰³ Geo. Mahomed,¹⁵ H. Fenwick,¹³⁹ W. H. Morse,¹⁰⁴ Kingsbury,² Caulwell.²⁰² Javeine⁶⁸⁶ reports 3 cases of marked glycosuria treated with this remedy. In 2 cases the drug was employed in the form of powder, in doses of 1 gramme (15 grains) three or four times a day, during twelve consecutive days. In the third instance the same amount was administered in the same manner for one hundred and forty-seven days, but no good results followed. The patients continued in the same condition. J. A. Granger and H. Vandenberg⁵⁸³ each give a case of diabetes in which the drug was employed, but with entirely opposite results. Success was observed in the first case. In the second instance the drug proved wholly inefficacious. A. E. Balfour¹⁰⁸⁹ cites a case of a man, 65 years of age, who, in spite of a diabetic *régime*, continued to present all the symptoms of a well-developed glycosuria. Before the drug was administered the patient weighed 70 kilos (175 pounds), and every twenty-four hours he would pass 2700 grammes ($5\frac{1}{2}$ pints) of urine of a specific gravity of 1038, of a yellowish-green color, of an acid reaction, and containing 120 grammes (4 ounces) of sugar. After a month's treatment the specific gravity of the urine was 1038; this was reduced to 1800 grammes ($3\frac{1}{2}$ pints) every twenty-four hours, and the quantity of urine lowered to 70 grammes ($2\frac{1}{2}$ ounces). In seven more days the sugar was increased to 97 grammes (3 ounces), and the results in general were little satisfactory. In three more weeks the patient had lost 1 pound (500 grammes) in weight, and both the quantity of the fluid and the amount of sugar continued to increase. The patient was again subjected to a diabetic diet and the powder of jambul in appropriate doses, but the ultimate results continued to be negative. The author, however, attributes the failure to the advanced age of the patient, which, in itself, made the case a rebellious one,

Kaori.—Kaori is a conifer found in New Caledonia and New Zealand, and is the *Dammara Australis*. Two resins are obtained from it: the fossil resin and the modern resin. The first is the one usually found in commerce, and is generally the product of the aromatic dammar. In a concentrated 90-per-cent. solution it has the consistency of a syrup. In this form it has been used by Forné⁸ in local affections, such as ulcers and other skin troubles. It has been found to replace advantageously collodion and traumaticine, or chrysophanic acid. By itself, or incorporated with other substances, it has been employed in parasitic cutaneous diseases, such as herpes, zona circinata, and others. Equal parts of an alcoholic solution of kaori and olive-oil constitute a most excellent liniment. Internally, the tincture of kaori has given excellent results in vesical catarrh. Constantin Paul⁸ has obtained good results from the use of kaori in affections of the skin, such as eczema. The tincture of the drug has also been employed in the treatment of scarifications produced by the thermo-cautery and the superficial lesions resulting from the application of continuous currents and exploring punctures.

Kava-Kava.—Baldi²⁸⁸ has published the results obtained from a study of kava-kava, or *Piper methysticum*. From the root of the plant he has extracted three substances. The first appears in the form of white crystals; the second in the form of pale-yellow crystals; both these substances are insoluble in water, but soluble in alcohol, especially the second body. The third substance is a resinous body of a yellowish color, and having a peculiar odor of piper. According to the same investigator, kava-kava acts somewhat like cocaine. Injected into the lymphatic sac of a frog, it produces paralysis of movement and diminution of reflex action, followed by complete loss of reflexes and by general paralysis,—a condition similar to that caused by curare. The respiration is arrested and the heart's action slowed, but, unlike cocaine, it does not produce convulsive movements. Similar results were observed in pigeons and guinea-pigs. Upon the eye it causes complete anaesthesia, but not inflammatory phenomena. A fourth resinous substance has been extracted by the same author, that appears to possess properties resembling those of digitaline. Kava-kava may thus be employed with advantage as an anaesthetic in rhinological and ocular practice, especially where cocaine is generally used.

Kefir.—This substance has acquired much repute in Vienna, Berlin, and Paris for its asserted power of increasing digestion, strengthening the nervous system, and increasing the general weight of the body. It is a preparation of milk, and Uffelmann,²² who has made a careful chemical examination, has found it to be made up of the following bodies: albumen, 3.12 per cent.; fat, 1.60 per cent.; sugar, 1.62 per cent.; lactic acid, 0.83 per cent.; alcohol, 2.10 per cent.; carbon dioxide, 0.98 per cent. Kefir ferment, according to the same investigator, converts the milk into alcohol, carbon dioxide, hemialbuminose, and peptone compounds, while the casein is divided into small particles in combination with the fat, forming an emulsion. The lactic acid converts the casein into minute coagula and performs in the stomach the work of the gastric juice; the carbon dioxide increases the flow of this juice and hastens the peristaltic action of the bowels; the alcohol stimulates the nervous system, preventing chemical decomposition and thus increasing nutrition; and, lastly, the peptones serve to make the whole substance easily borne by the patient.

Kola-Nut.—From a series of experiments Clement²¹¹, has come to the conclusion that kola-nut increases muscular force. Experiments made in the laboratory of the Cochin Hospital have led Dujardin-Beaumetz and Monnet²¹² to assert that the kola-nut possesses an elective action on the general nutrition and particularly on the circulation. The alcoholic solution in doses of from 8 to 20 grammes (2 to 5 drachms), the tincture in from 4 to 10 grammes (1 to 2½ drachms), and the infusion itself exercise a real action on cardiac diseases. They think that kola-nut contains twice or three times as much caffeine as coffee itself. Monnet was the first to speak of its diuretic properties as observed in clinical work, and believes them to be due to the caffeine and theobromine which the nut contains. Finally, the tannin found in the drug has been recommended in the treatment of obstinate diarrhoea. Later, Cunéo and Durian have confirmed these results.

Lactose.—Sophie Meslach²¹³, believes that lactose is not the only diuretic sugar, as glucose acts in the same way. Lactose, absorbed in the form of glucose, acts solely on the kidneys, but does not pass into the urine; its effect is to raise the quantity of this fluid. Under its use good results are obtained when the kidneys are healthy or nearly so, and in dropsy of cardiac origin when

there is only a small proportion of albumen in the urine. It may be given in doses of 200 grammes ($6\frac{1}{2}$ ounces) of a 75-per-cent. syrup per day. The grape cure, so much in vogue in Switzerland and Germany, is said to act by virtue of the glucose. For diarrhoea in children Hayem prescribes 10 to 15 grammes ($2\frac{1}{2}$ to $3\frac{3}{4}$ drachms) of lactic acid, 800 grammes ($1\frac{1}{2}$ pints) of water, and 200 grammes ($6\frac{1}{2}$ ounces) of sugar-syrup. With this treatment success was also obtained in cases of cholera nostras of adults. Hayem recommends, in Asiatic cholera, 10 to 20 grammes ($2\frac{1}{2}$ to 5 drachms) of tartaric acid in the twenty-four hours, in divided doses of from 4 to 6 grammes (1 to $1\frac{1}{2}$ drachms).

Lithium Carbonate.—This substance has been generally used in the treatment of various forms of uric-acid diathesis, in doses of from 20 to 30 centigrammes (3 to $4\frac{1}{2}$ grains). Carles¹⁸⁸ has found it advantageous to triturate the carbonate of lithium with bicarbonate of sodium or with sugar, in order to facilitate its solution in gaseous water, and believes this process to be important from a pharmaceutical and practical point of view.

Lobeline.—An elaborate study of the properties of lobeline has been made by H. Dresser.²⁷⁸ He asserts that lobeline is the only active principle of *lobelia inflata*. It is a fixed alkaloid and in no respect analogous to a glucoside. It may be obtained in the form of a combination with a salt of platinum. Lobeline is a respiratory poison, as warm-blooded animals succumb to paralysis of respiration. In dogs it produces loss of voluntary movements and a concomitant exaggeration of the reflexes. Later, it produces paralysis of motor nerves, like curare. As it paralyzes the cardiac branch of the pneumogastric nerves, it may be included under the nicotine group. Lobeline causes an acceleration of the respiratory movements, which is more persistent when the vagi are intact. Further, it augments the power of the respiratory muscles. Small doses suppress the inhibitory influence of the pneumogastrics on the heart. The respiratory centre is particularly excited under the action of the drug, so that the work of the heart and that accomplished by the respiratory muscles are greatly increased. While it stimulates the respiratory functions, it does not depress the system like hydrocyanic acid, and in energy it even surpasses aspidospermine. It would seem, therefore, that experimental facts substantiate the employment of the drug in asthmatic troubles,

although the author has not as yet offered any suggestions as to the proper form in which the alkaloid should be employed.

Lychnis Flosleuculi.—This plant belongs to the order *Caryophylla*. Its properties were communicated to Greene, of Ferns,²⁸, by an aged botanist, and he was soon convinced of its efficiency in affections of the bladder. Two handfuls of the plant are chopped finely, boiled in about $\frac{1}{2}$ litre (1 pint) of sweetened milk for about a quarter of an hour, let cool, and filtered. This quantity is to be taken night and morning, and two doses are said to give complete relief. The decoction of the plant contains iron, silica, aluminia, and insoluble phosphates; but the analysis is not yet made. It is supposed to contain an alkaloid.

Lycopodium.—E. H. Fenwick²⁹ has found no better drug than lycopodium to relieve enuresis, even in cases of several years' standing. He has found it excellent, not only in the nocturnal enuresis of children, but also in adults, in whom, under its use, micturition was quickly reduced from six or eight times an hour to once in two hours. The preparation employed was the tincture, in doses of from 15 minims to 1 drachm (1 to 4 grammes).

Lysol.—This new antiseptic has been obtained by V. Gerlach,³⁰ from tar-oils, by boiling with alkalies and fats. With regard to its germicidal powers, in a comparative test with phenic acid, sulphurous acid, and creolin upon the spores of anthrax bacilli, the staphylococcus pyogenes, and cocci of erysipelas, it has been found that lysol possessed special advantages. It appears to be perfectly innocuous, and has been administered to rabbits, through subcutaneous injections, in doses of $\frac{1}{2}$ drachm (2 grammes) daily for fourteen days, without producing death. It has been employed in surgical operations and in vaginal and uterine disease with satisfactory results. It has no irritant action on wounds, but a 1- to 2-per-cent. solution causes slight burning on mucous surfaces. A 0.3-per-cent. solution destroys all organisms within twenty seconds, and as a general antiseptic a 3-per-cent. solution is generally sufficient. It is an excellent disinfectant for the hands in 3-per-cent. solutions, having the properties of soap. Mauthner,³¹ on the contrary, has failed to obtain any good results from its use.

Manganese.—The binoxide of manganese, in doses of 2 grains (0.13 gramme), in pill form, has been employed by E. J. Hauck,³² in cases of simple amenorrhœa. He has never seen

untoward effects following the use of the drug, and believes that it can be given in doubtful cases of pregnancy, for the remedy will not bring on labor; and amenorrhœa, due to whatever cause, will be benefited. The pills may be taken one hour before meals, their ingestion to be followed by a little water fifteen minutes later, in order to avoid the burning pain in the stomach, which they are liable to cause.

Massage.—Of the recent papers published on the subject of massage the most exhaustive is that of Gilles.⁴⁶ *Dec. 20, 1898; Feb. 28, June 20* From an experimental study he has come to the general conclusions that massage forces the materials injected into the tissues or into the articulations in a centripetal direction, and that it increases the absorption of injected liquids. These results are supported by the experiments of Höffinger, cited in the work of Petit. These latter authors demonstrate that the co-efficient of absorption of water by the peritoneum is increased by massage. Recklighausen confirms these results. Independently of mechanico-circulatory action, there is an indirect action exercised on the vaso-motor system. Independent, again, of the general action of massage, this produces an arrest of the malady in cases of nervous diseases. The pain disappears, the patients sleep, the muscles regain their normal volume, and, finally, there is almost always obtained a perfect cure. The effects of disorders of the spinal cord are psychical, neuropathic, muscular, and arthropathic; in these cases massage produced good results from an action exercised on the peripheral terminations of the nerves ending in the diseased centres, and on the parts innervated by these centres. The method, also, by a double action, effects cures in cases of chronic muscular rheumatism complicated with atrophy. Massage is of value where the hand can act on the seat of lesion, as in cases of peripheral neuritis, primary or due to traumatic causes. The treatment augments electro-muscular contractility.

The author believes that massage effects cures in a variety of medical and surgical cases: in diseases of the articulations, luxations, lumbago, cerebral haemorrhage, syphilitic and blennorrhagic arthritis, acute and chronic epididymitis, and other affections, even of the female genital organs, acute and chronic myositis, torticollis, muscular contractions, muscular atrophy, and muscular paralysis. The active and passive movements of muscular massage act favor-

ably on the progress of arthritis, and the treatment of arthritis arrests the invading progress of atrophy. Suspension, which is an indirect massage, is a violent procedure, but nevertheless it gives incontestably good results. The method should be modified.

Massage acts on the nutrition of the tissues, especially that of the skin and muscles. In this connection 3 cases are reported where massage produced the best results. One was of spasmotic tabes, the second of sclerosis en plaques, and the third of polyarthritis deformans and chronic muscular rheumatism. All had muscular atrophy and rheumatic pains, with small, fascicular, muscular contractions. Under massage the muscular atrophy, the pain, and the contractions finally disappeared.

Of the diseases of the nervous system where massage is asserted to have produced good, and sometimes permanent, results, the author mentions hysteria and neurasthenia. In these cases, particularly where internal medication has failed, massage, in combination with the rest-cure, often effects the most excellent results.

Thomas Stretch Dorose,²² holds that massage is a cardiac tonic, and acts in the same way precisely as caffeine and digitalis, by stimulating the muscular fibre, and with the advantage that this tonic-power of massage is more natural and more permanent than that produced by the drugs mentioned. Stimulation of the nerves and ganglia of the heart increases the muscular tone of the cardiac fibre; therefore, massage, by regenerating contractile power of muscle through a direct action on thermogenic material, as well as through an influence exercised on the nerves and centres, will have a tonic effect on the heart. This organ, which does more work than any other organ of the body, has to overcome resistance in its various forms, especially that induced by contraction and relaxation of the blood-vessels. Massage relieves the circulation and the resistance offered, and in this manner, by allowing the organ more free play, increases its tonicity and power. Hence, the results would be more permanent than those produced by the action of drugs.

In a recent research, J. R. Kappeler⁵⁴, has tried to determine whether, by means of massage, pathogenic micro-organisms can be removed, by way of the lymphatic glands, from the seat of infection, and whether such removal could be effected before any specific action of the bacteria became manifested at the seat of

inoculation. It was the object of the investigator to discover likewise whether the organisms thus treated perished or still retained their specific properties. Experiments were made with the staphylococcus aureus; of this an artificial pure culture was employed. The seat of inoculation was the knee-joint, rabbits being the animals employed in the experiments. After injection the joint was rubbed for seven minutes, this operation being repeated after half an hour; it was then continued for several days afterward, twice daily, and for fully ten minutes during each operation. The results appeared to be negative, for Kappeler found, after many careful experiments, that both in joints which were rubbed and in those which were not rubbed an effusion of pus occurred by the fourth day. The effusion increased somewhat for a day or two and then remained stationary.. The pus in all instances was yellow and creamy, and contained the staphylococcus, which retained its vitality and specific power even when left in the joint for a period of a hundred and twenty days. In all cases severe diarrhoea, and in a few instances pneumonia, occurred. There was no disease found in the long bones or ~~other~~ joints in any of the animals experimented upon; in several of these secondary abscesses of kidney and liver appeared, and the staphylococcus could be cultivated from the pus of the joint subjected to massage as well as from that which was left at rest. Other results were likewise of a negative character, and from all the investigator concludes that massage is incapable of removing a specific pyogenic germ from the knee-joint by means of the lymphatic vessels. Massage in such cases appears to be unattended with danger, but from this it could not be inferred that the process would be harmless if applied to a seat of inoculation of a more vascular character. The removal of bacteria might be hastened, however, by massage in places where the effusion of leucocytes might not be sufficient to block the lymphatic vessels. All these results have reference only to the staphylococcus pyogenes aureus. Douglas Graham¹⁰⁹,_{pp. 14, n.} has made an elaborate research upon the subject of massage to show that the procedure has been of great practical value in the treatment of disease. From statistics published by the author it has been shown that cases of sprains got well in one-third the time under massage than without it, and with less tendency to subsequent pain, weakness, and stiffness. In fractures, even, massage has been of great

service. Good recoveries have been obtained by French surgeons, notably, Championnière and Rafin. In such cases massage promotes absorption of effused products, prevents stiffness of joints, atrophy of muscles, and favors repair of tissues. Of the cases reported by Rafin, recovery took place in 3 of fracture of the fibula, in thirteen, twenty-two, and thirteen days, respectively; in 2 of the radius in nineteen and twenty days; in a double fracture of the ulna in twenty-seven; in a fracture of the external condyle of the humerus in a child in nine days; in a fracture of both malleoli in a child in fifteen days; in a fracture of both malleoli, with subluxation of foot outward and backward, in an adult, in forty days. In transverse fractures of patella, Tilanus, of Amsterdam, uses, instead of compression, massage and early movements of the joints; in this way atrophy and stiffness is prevented, effusion being quickly dispelled. Six patients treated in this manner could walk very well in fourteen days. A patient referred to by Rafin, and subjected to this treatment, walked perfectly in forty-two days. Similar results have been noticed in 5 cases reported by Wagner, of the Austrian army. In these cases even the application of bandages was dispensed with. Graham himself speaks of 3 cases of relaxation of ligaments where massage produced excellent effects. In all of them the paralyzed muscles, from want of use, and which were unable to extend the affected leg at all, in a few weeks could hold it fully and voluntarily for seven, nine, and ten minutes, respectively. The first case was one of a stout lady who had the remains of an old synovitis. The second was a man, 63 years of age, who, as a result of an injury, had developed a rheumatismal arthritis of the left knee; here, under massage, the quadriceps extensor muscle improved and the peri-articular thickening disappeared. The third case was that of a woman suffering from relaxation of the quadriceps extensor, which allowed the patella to slip externally without the power, voluntary or involuntary, of replacement. In this case the patient was also made to wear a few turns of roller bandage, in order to keep the patella *in situ*. Eccles, of London,¹⁵ has found that thirty minutes of massage on the abdomen lessens the temperature on the surface of the body, but increases it in the rectum. General muscle-kneading, however, had the opposite effect, for under its action the surface and axillary temperature increased, while that of the rectum diminished.

The same investigator found that the pulse was accelerated and the blood-pressure increased, even when the skin was warm and the blood-vessels dilated,—due, probably, to an increased force of the heart's action. Hünerfauth, of Hamburg,⁴¹ has reported 53 cases of chronic typhlitis and perityphlitis, in which massage improved or even cured permanently those pathological conditions. Such improvements and cures could only be brought about by means of massage. This procedure was applied for from fifteen to twenty minutes, twice daily. Mild cases required a treatment of from six to eight weeks, while severe cases required from three to four months. But in such cases great care must be exercised on the application of the massage, which, at first, should be firm but gentle.

From trials made on a series of patients, Mervy¹⁰⁰ arrives at the following conclusions: 1. The muscle is a veritable accumulator. 2. It is susceptible of being excited by an individual, by direct contact, or by influence. 3. It is auto-excitant. Muscle must be in a physiological normal state. In cases of rupture of its point of attachment, there is augmentation of volume, but no contraction. Experiments prove the presence of a neuric force spreading everywhere, as is demonstrated by the discovery of human polarity by Chazarin and Ch. Décle, and the experiments of Rochas. Ruptures of the equilibrium of this force are the cause of many diseases that are cured in re-establishing it.

In cases where baths cannot be applied, in order to produce culminative effects with tendency to sleep, Alldorfer²⁴, has resorted to the application of bandages. Linen cloths, soaked in warm water, are wrapped over the belly and the lumbar region, and then covered with oiled silk or rubber-cloth to prevent evaporation. By this method the author claims to have produced the most astonishing results in the treatment of insomnia.

Medicated Inhalation.—This subject of medicated inhalation has recently been brought forward as a method of treatment heretofore somewhat neglected. Although Nothnagel has demonstrated the power of absorption in the hæmatoic system, yet administration of drugs by the lung is seldom practiced. However the remedy may be given, either by inhalation proper or through dusting, it has been found that drugs act in this way earlier, and as a consequence they are sooner found in the urine than when given by the mouth. The effects, on the whole, are as rapid as

when the substance is directly injected into the veins. Better advantages are obtained by employing the method of "spiro-therapeutics," recently proposed by Neudorfer at the last Vienna Congress.^{22,11} In this way this investigator has practiced disinfection, for which purpose he has used, by inhalation, sublimate, phenol, creasote, and creolinum vienneuse, as well as sublimate and tartaric acid combined with the creolin in the proportion of 1 to 3000, creasote and phenol in the proportion of 1 to 1000. No bad effects have followed these inhalations. He affirms that he has employed creolinum vienneuse, in the proportion of 2 to 5 in 1000, in tuberculosis and bronchial catarrhs, with no untoward effects, but with decided benefit. He found that creolin was a powerful bactericide. In cancerous cases he has used 5- to 10-per-cent. solutions of the carbonate of potassium. How the alkalinity of the blood was influenced, whether it was diminished or increased, was not determined. On the whole, inhalations through the lungs might be of decided benefit, especially in those urgent cases where absorption in the intestines and the lymphatic system has been destroyed, as in Asiatic cholera or tetanus; in such cases the largest quantities of drugs may be administered with no effect whatever, as they pass through the alimentary canal unchanged. But through the lungs, however, if the functional disorder does not co-exist in these organs, this method of inhalation might serve an excellent purpose. On the strength of the hypothesis offered to the effect that the epithelium of the alveoli of the lungs, with the aid of the oxygen, has the power of converting fluids into gaseous form, to be better absorbed by the blood, feeding the organism with inhalations of milk has been proposed, especially in urgent cases. It is well known that, in cases where life has been endangered by extensive haemorrhages, an injection of 0.6-per-cent. solution of common salt or injections of haemoglobin and transfusions have restored the depressed blood-pressure and temporarily relieved the patient. But these measures have many disadvantages, as the frequent opening of blood-vessels gives rise almost unavoidably to the introduction of foreign bodies, which may cause a fatal issue. It is in such cases that inhalations of blood, for instance, might be of the greatest service. Neudorfer, by actual experimentation, sustains the practical importance of medicated inhalations.

Medication by the Trachea.—Colin, basing himself upon the fact accidentally discovered by Bichat that substances introduced into the bronchi of the lungs do not produce untoward phenomena, as might be supposed, long ago determined that absorption takes place very rapidly from the bronchial tubes. This fact has also been observed by Bouchard from experiments performed upon rabbits. The subject has been again alluded to by Botey⁸ before a recent meeting of the French Academy of Sciences. Botey first experimented upon rabbits, and found that injections into the trachea did not produce serious trouble nor disturbance of the respiration so long as the injection did not exceed 50 drops. Death was rapidly produced in a young rabbit with a little over a drachm (4 grammes) of water, the symptoms being œdema and congestion of the lungs, accompanied by effusion of bloody froth into the bronchi. Astringent solutions were employed, after which no serious accidents occurred. To three rabbits 50 centigrammes ($7\frac{1}{2}$ grains) of a $\frac{5}{10}$ -per-cent. solution of nitrate of silver or of bichromate of potassium were administered through the trachea, and no inconvenience was noticed; and, curiously enough, the same amounts introduced into the stomach through the œsophagus were followed by serious accidents. He then experimented upon himself by introducing into his own trachea, by means of a curved canula, 160 minimis (9.86 grammes) of distilled water, having previously produced anæsthesia of the larynx with a solution of cocaine. The operation was followed by no discomfort nor the least amount of cough. He repeated these experiments for several successive days, and only found that the respirations were reduced to 17 from 21, and the pulse diminished to 74 from 82. By continuous operations he found that he could inject into his trachea, without producing cough, more than two syringefuls of water, with the final result that both the respirations and the pulse were decreased. Clinically he mentions the case of a woman with syphilis of the larynx and trachea, in whom he injected 12 grammes (3 drachms) of a 1-per-cent. iodated solution, without even anæsthetizing the larynx, and no bad results followed. Two days afterward an injection of 15 grammes (3 $\frac{1}{2}$ drachms) was administered, after previous anæsthesia of the larynx, without producing any untoward effects. Appropriate doses of corrosive sublimate and iodide of potassium were afterward administered in this form of injections,

and the patient, who had previously undergone the most energetic internal treatment, finally recovered from her affection. In this instance he also observed that after the tracheal injection the respirations were diminished for several hours from twenty-four to eighteen.

Menthol.—Valerius Idelson⁵⁸⁶ has successfully employed menthol in the treatment of pulmonary and laryngeal tuberculosis, according to the suggestions of Koshlakoff and Simanovsky. In 8 out of 12 cases Idelson found that: (1) the menthol treatment was followed by a great amelioration of the general condition of the patient; (2) the remedy improved the appetite, promoted easy expectoration, and gradually decreased the daily quantity of the sputa; (3) the drug never gave rise to any renal irritation; and (4) it never induced haemoptysis. In the 15 cases of laryngeal tuberculosis treated with menthol, the author found the drug to possess considerable analgesic action, the patient feeling a very marked relief for some time after each application. The paintings decreased local inflammatory phenomena and did away with infiltrations. They also promoted healing of superficial ulcers, but could not, however, bring about cicatrization of deep ulcerations. Local irritation may be caused by 40- to 50- per-cent. solution; so that it is advisable always to begin with a 10-per-cent. solution, and to gradually increase this strength. In all cases the local must be accomplished by general treatment. In two of the phthisical patients treated the remedy increased the acidity of the gastric juice, as well as the absorptive and motor power of the stomach. In pulmonary tuberculosis the drug was administered internally, as in the following prescription:—

R. Mentholi, 3J (4 grammes).
Pulv. acaciæ sacchari albi, : : : aa 3ss (2 grammes).
M. et ft. pil. no. xl.

Of these pills 5 are to be taken, gradually increasing the number to 20, 30, and even 40. The inhalations were used from ten to twelve times a day. The paintings were applied with from 10- to 50- per-cent. solution, once daily, once every two days or twice a week, according to indications. L. Weiss⁸⁴ relates that a woman who had vomited after each meal for three weeks was relieved at once by the use of menthol. In order that the drug may remain in solution, he advises that it be given in the following form:

menthol 1, dissolved in spirit vini 20, syr. sacch. 30, and that of this mixture a teaspoonful be given every hour.

Mercury.—A new way to use mercury, especially the corrosive sublimate, for preventing the pitting of small-pox, has been spoken of by Talamon.⁸⁰ A solution of the salt is to be supplied by means of an atomizer in the following manner: For the first or second day of the eruption, the face is to be washed with soap and water, rinsed with borated water, and wiped dry with absorbent cotton before using the syringe. After the third day the washing is unnecessary; the eyes are now protected with borated wadding, and the solution applied with the atomizer. In this way the skin is given a frosty appearance, and the danger of blistering by too copious a dose is avoided. The spray is to be applied chiefly to incipient pustules. Fifteen minutes after this operation of atomizing, which should not last more than a minute, the face is to be rubbed with a pledget of wadding dipped in a glycerin solution of sublimate of the strength of $\frac{1}{2}$ drachm (2 grammes) to the ounce (32 grammes), the operation to be repeated three or four times during the twenty-four hours in the first three days, twice until the sixth or seventh day, when the spray may be suspended and the glycerin painting continued until the scabs begin to drop off. The results were highly successful except in cases, of course, of confluent small-pox; salivation never occurred, as the absorption failed to take place through the diseased skin. The spray-solution is made up as follows:—

R Corrosive sublimate,	.	.	.	.	.	gr. xv (1 gramme).
Citric acid,	.	.	.	.	.	gr. xv (1 gramme).
Alcohol, 90°,	:	.	.	.	.	Mlxv (5 grammes).
Ether,	.	.	.	.	q. s. to make	XXXiiiss (48 grammes).

This solution contains 2 per cent. by volume of sublimate. Augagneur² refers to the case of a syphilitic patient in whom ulcerated stomatitis was produced after subcutaneous injections of mercury into the buttock. The attacks of stomatitis were induced by blows on the buttock, and on one occasion when the symptom was unusually severe, owing to a fall upon the part injected, Augagneur opened the buttock by means of an incision, and by pressure squeezed out the mercury. The stomatitis disappeared after the operation.

The introduction of mercury into the system by means of

electric baths has been studied by G. Gaertner and E. S. Ehrmann.³ A mercurial bath is prepared, and, by means of a diaphragmatic arrangement, divided into a superior and an inferior compartment. The walls and the floor are furnished with electrodes; one of the compartments contains the positive electrode and the other the negative, both connected with a proper battery. The diaphragm is made of an appropriate insulating substance. Capillarity exists between the two compartments, and these communicate only with the human body. The intensity of the current passed is indicated by means of a galvanometer, and its passage through the body can be exactly measured. From a series of studies the authors found (1) that the intensity of the current was the same in all the parts of the skin bathed by the water; (2) that feeble and strong currents can be applied; (3) that the intensity of the current which passes through the human body can be measured with accuracy. In one case a young man was placed in the electric bath and made to occupy the inferior *positive* compartment, which contained 4 grammes (1 drachm) of corrosive sublimate in solution. The intensity of the current was of 100 milliampères and the duration of the bath of fifteen minutes. In the first twenty-four hours after the bath, the urine already contained a considerable quantity of mercury; on the fourth day 0.007 grain (0.00045 gramme) of the metal were detected in the urine. Two other trials were made upon 2 patients of the same age and constitution. Each one was placed in his own bath, each bath of fifteen minutes' duration, and subjected to an intensity of current of 100 milliampères, with the difference that the bath of the one contained 4 grammes (1 drachm) of corrosive sublimate in the inferior positive compartment; that of the other was a simple bath. The first patient eliminated in the first twenty-four hours 0.003 gramme ($\frac{1}{2}$ grain) of mercury; the second never had the drug in the urine. The third experiment was made upon one of the authors, Gaertner, after being assured that the urine was free from mercury. He was placed in a bath containing 6 grammes ($1\frac{1}{2}$ drachms) of corrosive sublimate; the intensity of the current was of 100 milliampères, and the duration of the bath of twenty minutes. At the end of the bath, a metallic taste was perceived in the mouth, together with a slight tenderness of the gums, these symptoms persisting for twelve hours after the experiment. The urine, on the

first twenty-four hours, gave a mercurial reaction, and this continued to do on the second and third days. A quantitative analysis of the urine, on the fourth day, gave 1 centigramme ($\frac{1}{6}$ grain) and 3 milligrammes ($\frac{1}{20}$ grain), a quantity to be met with in the human body in cases of poisoning. Mercury was still found in the urine on the fifth and sixth day, but very little was found in that of the eighth day. In all the experiments performed, the skin of the individuals subjected to the method was found absolutely intact. The most prominent sensation felt in the electrical bath was of tingling character. The urine exhibited the drug in the same day of the experiment,—a fact that goes to show that the metal soon found its way into the vascular portions of the skin. The results of these experiments appear to be of the greatest practical importance from a therapeutical point of view, and from them the authors have arrived at the following conclusions: 1. By the introduction of mercury through the skin, in the method described, as by inunction and hypodermatic injection, the metal is prevented from acting on the alimentary canal and the liver, where it is apt to accumulate. 2. It is possible that, as it comes in contact with the cutaneous surface, the mercury exercises a local action on the germs contained in the skin. 3. The quantity of mercury introduced is in proportion to the intensity and duration of the current, which permits of exactly measuring the quantity given. 4. The method is painless and without danger, and does not produce salivation. The authors contemplate continuing their experiments,—not only with mercury, but also with other substances, such as iron.

A substance which has been spoken of by Lister² as affording great advantages as an antiseptic material for impregnant surgical dressings, and called a double cyanide of zinc and mercury, has been subjected to analysis, and found to contain 17.7 per cent. of cyanide of mercury, of which 2.86 per cent. could be removed by cold water; upon the remainder water exercised no solvent power. Further investigations seemed to show that, when very concentrated solutions are used, the particles of mercuric cyanide formed are in excess of the solvent capacity of the water, and that the undissolved particles become simply entangled with those of the insoluble cyanide of zinc. The combination used by Lister was not, then, a chemical one, but it has been demonstrated that a

definite uniform product can be obtained, and this, which contains twice as much cyanide of mercury as the original combination, would, according to Lister, be a more powerful antiseptic, and devoid of irritating properties.

A new method of administering mercury has been proposed by Quinquaud, the subject being discussed before the Society of Dermatology and Syphigraphy, at a recent meeting held in Paris.⁸⁰ Quinquaud has obtained good results with calomel plasters applied to the splenic region. Before applying, the skin is to be washed with soap and water. The plasters should remain for eight days; they are then removed and treatment suspended for eight days, after which they are again applied, to remain for the same period of time, and so on. In the case of hard-working patients the plasters should be changed every four or five days. The absorption of the mercury takes place without fail and can easily be watched, as, by certain chemical processes, the drug can be detected in the urine. From observations practiced on 20 patients Quinquaud found that mercury appears in the urine four days after the application of the plaster. Treatment being suspended, the mercury was found in the urine twelve days, one month, and even in six weeks afterward. The curative effects were as satisfactory as when the drug is given in the usual way, with the advantage that stomatitis was avoided. The plastic mass is composed of the following ingredients:—

B	Diachylon plaster,	31x (1920 grammes).
	Calomel,	3xx (640 grammes).
	Castor-oil,	3vj (192 grammes).

M. and make into plasters, 4 by 4 inches, or spread on cloth and divide into squares of the above size.

Chibret,¹⁷⁸ agrees with Sattler and Gayet in that the *micrococcus pyogenes aureus* is present in apparently perfectly healthy conjunctival sacs. Chibret, however, holds that the operation for cataract can be performed successfully without troublesome complications. He has made a series of experiments with the oxycyanide of mercury, and has found that the drug is a powerful antiseptic. He treated 14 patients by means of irrigation with a solution of the drug in the proportion of 1 part to 1500 of water. On subsequently submitting the conjunctival mucus to systematic culture, Chibret found that the tubes only remained sterile in 20 per cent. of the cases. The other tubes contained various microbes,

especially the *pyogenes aureus*. Further experiments proved that the eyes could only be rendered thoroughly aseptic by eye-douches, repeated every few minutes for at least three days; and the author considers the oxycyanide superior to solutions of the bichloride, and affirms, further, that it is better borne by the conjunctiva. As a disinfectant, especially in the case of metallic instruments, Chibret⁸ considers the oxycyanide of mercury the best substance, in a 3-per-cent. solution, which corresponds to a 2-per-cent. solution of corrosive sublimate. The same author has employed injections of 1-per-cent. solution in the treatment of syphilitic conditions. The injections are well borne, little painful, and, used in over 1000 cases, he has never observed untoward effects. Six or eight injections are equivalent to an energetic treatment by means of frictions.

Forty cases, in which the salicylate of mercury was used, are described by Szadek.⁹ The author affirms that abscesses never occurred, although sometimes infiltration was noticed, as also slight inflammation of gums. Neither was there any stomatitis produced. The treatment, on the average, was continued for thirty days. While lymphatic swellings and pustulous eruptions were somewhat obstinate, secondary symptoms disappeared very rapidly under the use of the salt. Szadek, therefore, believes that this preparation is remarkably efficacious, particularly in cases of secondary syphilis. The drug was used in the form of emulsion, according to the following formula:—

- R Hydrarg. salicyl., . . . gr. xxiv-xxxvj (1.60 to 2.40 grammes).
- Mucilag. gum. arab., . . Mx (0.67 gramme).
- Aq. destillat., . . . fʒj (82.00 grammes).
- M. et st. emuls.

For internal use this salt of mercury can be given, according to Szadek,⁸⁵⁷ in the following formula:—

- R Salicylate of mercury, gr. xv (1 gramme).
- Powdered licorice-root, enough to make 60 pills.
- M. Sig.: 1 to 2 pills three times daily after meals.

The same author recommends the following as an injection in gonorrhœa:—

- R Salicylate of mercury, gr. ss (0.08 gramme).
- Sod. carbonate, gr. xv-xlv (1 to 3 grammes).
- Distilled water, fʒvij (256 grammes).
- M. Sig.: For one injection in gonorrhœa.

Plumbert offers the following combination for gonorrhœal injections:—

R. Salicylate of mercury,

Carbonate of potas., gr. xv-xlv (1 to 8 grammes).

Distilled water, Oij (1 litre).

M. Sig.: Injection for gonorrhœa.

The same author advises the use of the salt as a local application as follows:—

R. Salicylate of mercury, gr. ss (0.03 gramme).

Magn. carbonate, 3v (20.00 grammes).

M. Sig.: As a powder for external employment as a salve, or, 1 part to 30 of vaseline. For intra-muscular injection.

Jadassohn and Zeising recommend the following combination:—

R. Salicylate of mercury, gr. xv (1 gramme).

Liquid paraffin, Mclx (11 grammes).

M. Sig.: For intra-muscular injections.

This salt has been given internally for the treatment of syphilis, in doses of from $\frac{1}{4}$ to $\frac{1}{2}$ grain (0.001 to 0.0025 gramme), in the form of pills, two or three times a day, according to the case. It has also been employed as an intra-muscular injection in doses of $\frac{1}{6}$ grain (0.01 gramme) combined with an equal amount of carbonate of potassium.

C. J. Bond⁶ calls attention to the advantages derived from pellets containing equal parts of perchloride of mercury and chloride of sodium. Each pellet contains about $4\frac{1}{2}$ grains (0.30 gramme) of the perchloride, and dissolves in a pint of warm water in about three minutes, forming a solution of 1 in 2000. The advantages claimed by the author in this form of pellets are (1) that solutions of perchloride and chloride of sodium with hard water containing lime do not turn milky or throw down a precipitate, as is often the case with solutions made with double salt of ammonium chloride and mercury after standing a short time: this being of the greatest importance, as a solution so precipitated loses much of its antiseptic value; (2) the solution is neutral and not acid, as in the case of the ammonium salt; moreover, chloride of sodium is a natural constituent of the blood-serum and other fluids of the body.

It has been contended that mercury is injurious in those cases in which albumen is present in the urine, and, as the use of the drug is indicated in certain conditions where albuminuria co-exists,

it is of the greatest importance to determine whether the specific treatment should or should not be withheld in such cases. Practitioners have differed in this respect, but Prichard, as far back as 1835, asserted that numerous cases of dropsy, with albuminous urine, terminated in recovery under minute doses of mercury after other treatments had failed to produce a cure. The same results have been obtained by recent investigators⁸⁰⁸; so that it would seem that mercury is not contra-indicated in albuminous conditions.

For the treatment of dysentery, Lemoine²²⁴ has employed, with asserted good results, enemata of bichloride of mercury, especially in cases where ipecacuanha had failed, and where the patients complained, from the beginning, of nausea and vomiting. Two hundred and two patients were treated by calomel by the mouth and enemata of bichloride of mercury. To those who had no gastric intolerance calomel was given in minute doses at first. For others the enemata of the mercuric salt were used as follows: Of a solution of the corrosive sublimate, 1 part to 5000, three enemata of 200 grammes ($6\frac{1}{4}$ ounces) each were employed per day, at first. Later on, only one enema of 3 to 1000 parts was administered during the day. Improvement was almost immediate, the slimy and bloody stools being suppressed from the following day. The author lays particular stress upon the disappearance of the tenesmus and the colicky pains. The enemata should be given lukewarm, and for some patients a few drops of laudanum may be added to the injection. B. F. Ackley¹⁶¹ has used the biniodide of mercury with asserted success in the treatment of diphtheria and typhoid fever, and believes the drug to be an antiseptic and germicide of great value. For the first disease he has employed this formula: biniodide of mercury, gr. ij (0.13 gramme); saccharated pepsin, 3ijj (12 grammes). The powder is used as a local solvent and germicide, placing a quantity of it, proportionate to the age of the patient and the severity of the symptoms, on the tongue every hour. In this way the drug was found to have a germicidal effect on the membrane, hastening solution of the exudation even in severe cases. In addition to this treatment, he has also employed, through insufflation, a powder containing 2 grains (0.13 gramme) of the biniodide of mercury and 20 grains (1.30 grammes) of trypsin, to be applied every four hours. The administration of the remedy is regulated, then, by the gradual improvement. The

efficacy of the drug was most satisfactory in laryngeal cases, as in most of these the discharge was brought on soon and abundantly, the symptoms subsiding in the course of twenty-four hours. The remedy also gave satisfactory results as a prophylactic. In cases of typhoid fever, especially if the treatment was instituted early, the drug has produced such satisfactory results that in no case has a patient been confined to his bed for a longer period than two weeks. The author believes that he was able to abate the disease by employing the drug in the prodromic period. For this purpose, as for the treatment of the disease when present, a mixture of $\frac{1}{10}$ to $\frac{1}{2}$ grain (0.006 to 0.005 gramme) and 10 grains (0.70 gramme) of saccharated pepsin was given every four or six hours. In these instances diarrhoea was checked, meteorism was rare, and chest complications were absent.

From the details of cases reported, C. R. Illingworth²⁸, appears to have been able to abort scarlet fever in five instances by the internal and external use of the biniodide of mercury. The temperature was reduced in six days, and convalescence followed in seven days. No case had dropsy. One, in which at first the throat was not painted, exhibited otitis; and one, where no local application at all had been made, presented a cervical abscess. In a third, urgent purging, which came on within twenty-four hours, was checked by the frequent exhibition of iron. The author asserts that he has prevented the disease from spreading by painting the throat with 1-in-500 solution every four hours. In the cases reported the following formula was used:—

R. Hyd. bichlor.,	.	.	.	.	.	3vj	(24 grammes).
Potass. iod.,	.	.	.	.	.	gr. xv	(1 gramme).
Sp, am. co.,	.	.	.	.	.	3j	(4 grammes).
Syrup.,	.	.	.	.	.	3ss	(16 grammes).
Aq.,	.	.	.	.	.	ad	3vj (192 grammes).

M. Sig.: Half an ounce every second hour.

This was used in a child 9 years old. For local application the solution varied from 1 in 2000 to 1 in 500, to be used in the form of a spray or by painting with a camel-hair brush. With regard to *sequelæ*, it was observed that desquamation, which chiefly affected the fingers and toes, was merely scurvy.

William Pepper¹¹² reports a case of heart-failure of a year's standing, with increasing severity of symptoms, in which the administration of blue mass produced the most excellent results

after other treatment had failed. The drug was combined with digitalis and sulphate of cinchonidine in the same proportion, 1 grain (0.065 gramme) of each in every pill. Three pills were taken daily. In twelve days all the symptoms had disappeared, the urine was free from albumen, and the œdema was entirely gone. Neither purgation nor ptyalism was produced, and the patient rapidly regained strength. The author has obtained excellent results with the same combination in cases of general œdema, as a result of weak heart simply or of organically diseased heart. Of course, regulated diet and hygiene should accompany the use of the remedies. From the use of calomel and digitalis in the treatment of 10 cases of dropsy from various causes, Gio-acchino Lipari,⁵⁴⁰ has drawn the following conclusions: 1. Calomel acts where digitalis has no effect, and, inversely, calomel does not produce diuresis in cases where this result has been obtained by the use of digitalis. It seems that the mercurial salt acts directly on the parenchyma of the kidney. The drug is therefore indicated in cases where there are no primary or secondary lesions of the renal organ. It is of no use as a diuretic, therefore, in cases with symptoms of nephritis. 2. Contrary to the results reported by Fürbringer, Leyden, Stiller, and others, the daily ingestion of 0.30 to 0.50 gramme ($4\frac{1}{2}$ to $7\frac{1}{2}$ grains) for six or ten days was followed by no untoward after-effects. 3. In some cases a combination with opium did not prevent intense salivation followed by a marked diuresis. 4. Tolerance for calomel is greatest in those cases where the diuretic action is most rapidly produced. On the contrary, the tolerance is least in those instances where the production of diuresis is retarded. 5. Although the urea and the solids in general are increased during the ingestion of the drug, it remains unsettled whether such an effect is due to a direct action of the salt or simply to the increased diuresis. 6. In some cases of ascites calomel failed to produce the desired effect until the fluid was evacuated by puncture or other means, due, perhaps, to the pressure on the renal veins. Geo. A. Fackler,⁶¹ from his studies, concludes that: 1. Calomel, and, in all probability, other mercurial compounds, possesses diuretic properties. 2. If given in proper dose the effect of calomel becomes evident in two or ten days. Continuance of the treatment during diuresis will not alter or increase the effect. 3. Its action

is most marked in dropsies due to heart disease. Its action in dropsies of hepatic origin is not to be relied upon. Pathological changes in the kidney prevent or abridge its action. 4. Small doses will prove of no avail. 5. The diuretic action may, in all probability, be ascribed to the irritating effect which the mercury, during its elimination, exercises upon the renal epithelium. Robinson¹⁵¹ reports the case of a man, 45 years of age, in whom mercurial inunctions were followed by severe ptyalism, painful tongue, loosened teeth, fetid breath, a papular and pustular eruption accompanied by intense itching and a purpuraceous desquamation. The temperature was raised to 102° F. (38.75° C.), and there were produced also loss of appetite, tremor, albuminuria, and other symptoms. The patient finally recovered under proper treatment. He exhibited, some time later, the same train of symptoms after the administration internally of 10 grains (0.67 grammme) of calomel divided in four doses. The eruption now was of a miliary and scarlatiniform character. The primary symptoms were chills and fever at night.

Methacetin.—As an antipyretic, in cases of typhoid fever, pneumonia, and other febrile diseases, Seidler has used methacetin in 28 instances, with fairly good results. Five to 6 grains (0.33 to 0.40 grammme) reduced to normal a temperature of 100.4° to 102° F. (38° to 38.80° C.), but larger amounts had to be used in higher fever. In florid phthisis, with an evening temperature of 104° to 104.6° F. (40° to 40.5° C.), 6 to 7 grains (0.60 to 0.67 grammes) of the drug prevented a rise beyond 100.4° F. (38° C.). These antipyretic effects were noticed in fifteen, twenty, or thirty minutes. The fall of temperature usually reached its minimum in about three hours, remaining stationary for about one hour, and then a rapid rise would ensue. To avoid, in cases of remission, a sudden rise of temperature, the drug should be given between 3 and 4 o'clock, when administered once a day. The reduction of temperature was accompanied by profuse sweating,—an objection to the use of the drug in phthisical patients. In only 1 case was there noticed an untoward effect on the heart, where 7 grains (0.47 grammme) of methacetin produced slight collapse. No other symptoms were observed. Five-grain (0.33 grammme) doses destroyed pains, fever, and swelling in 2 cases of acute articular rheumatism. Equally good results were obtained in 2 subacute cases. Methacetin

had little power over neuralgic affections. Heinz, of Breslau,⁴ Mar. 17, Apr. 14 has given the drug a fair trial as an antipyretic. In typhus abdominalis it reduced the temperature about 3° C. (5.4° F.), and produced, at the same time, profuse sweating. The rise took place slowly, but rigors were never noticed. Small doses, frequently repeated, tend to increase the period of apyrexia, especially when the temperature begins to ascend. Large doses lowered the temperature even below normal; this effect was seen under 15 grains (1 gramme), and in some cases under $7\frac{1}{2}$ grains (0.5 gramme). For adults the latter dose is sufficient. The remedy was also employed in migraine, influenza, and articular rheumatism, being most efficacious in the last disease, as observed in the few cases treated. As an anodyne the dose may be set down as being twice as large as when used as an antipyretic, and, compared with phenacetin, the dose is one-half as large. Methacetin was well tolerated, even in large doses. No untoward effects were observed.

Methacetin has been employed by Pescarolo,⁵⁰⁵ Nov. 27, '30 under Bozzoli, of Turin, in a series of observations in health and disease. It was found that methacetin produced in all instances a lowering of the temperature, this being its most important action. In disease the effects were more remarkable than in health. The affections treated were pulmonary tuberculosis, typhoid fever, acute articular rheumatism, and pleurisy, and in these the diminution of temperature, under the influence of the drug, was more or less pronounced, according to the case; 12 cases were carefully observed. In healthy individuals, presenting a temperature of from 37° to 37.5° C. (98.6° to 99.5° F.), 0.30 gramme ($1\frac{1}{2}$ grains) of the drug lowered the temperature 1° or 1.5° C. (1.8° or 2.7° F.) in from four to five hours, the hourly diminution being from 0.2° to 0.3° C. (0.36° to 0.54° F.). After this period the temperature gradually returned to normal. In tuberculosis, accompanied with continued fever, but exhibiting a slight remission in the morning, 0.30 gramme ($4\frac{1}{2}$ grains) in this period of remission reduced the temperature from 3° to 4° C. (5.4° to 7.2° F.), the effervescence being greatest at the fourteenth or the fifteenth hour, when the temperature would tend to resume the normal point. If, however, the drug is administered in the period of ascent, in doses of 0.20 gramme (3 grains), the temperature is diminished 1° to 2° C. (1.8° to 3.6° F.) in the course of three or four hours, after which the temperature

again rises with great rapidity to a febrile stage, but without the coming on of untoward phenomena. When a second and a third dose is given to combat this elevation of temperature, and it is observed that the drug becomes less and less efficacious, then methacetin, it may be said, is powerless to produce apyrexia of long duration. In cases of typhoid fever the drug acts differently in the various periods of the affection. During a continuous state, when the temperature ranges from 39.5° to 40° C. (103° to 104° F.), a first dose of 0.20 to 0.30 grammes (3 to 4½ grains) lowers the temperature 2° in two hours; it then rises to the primitive point, and if there is no ascension, a second dose of 0.20 grammes (3 grains) will keep the temperature at a low degree, but not at an apyretic point. During the last periods of the disorder, when the fever tends to assume a quotidian intermittent type, small doses are sufficient to lower the temperature as much as 3°; for example, from 40° to 37° C. (104° to 98.6° F.). In acute articular rheumatism, methacetin has a feebler action than in the preceding disorders. In these cases doses of from 0.40 to 0.50 grammes (7½ grains) are necessary to reduce the temperature 1° or 1½°. On the other hand, the drug exercises no action upon the articular pains.

Methyl-Acetanilid.—T. Jessopp Bokenham and E. Lloyd Jones,² report marked cyanosis following the use of continued doses of exalgin in a case of myelitis.

Gandinan¹¹⁶ asserts that exalgin will cause the disappearance of neuralgic pains in from one-half to an hour, and that even rheumatic pains cease under the action of the drug. In these cases single doses of 4 to 8 grains (0.25 to 0.53 gramme), or daily, of 6 to 12 (0.40 to 0.77 gramme), have been used. Seventy-five cases, comprising neuralgia, articular pains, epilepsy, tuberculosis, Pott's disease, diabetes, gout, and others, were treated with exalgin, with satisfactory results in nearly all of them.

Mistletoe.—J. T. Purviance and B. H. Brodnax,¹⁷⁶ who have tried the drug, believe *Miscus alba*, or mistletoe, to be an excellent oxytocic. Brodnax relates a case in which the remedy was a powerful aid in producing expulsion of the placenta. The same author has used it with success in expulsion of the foetus. Unlike ergot, it seems to exert its power on the fundus of the uterus, while the cervix and os seem to be less affected. The remedy appears to be perfectly safe and reliable. E. Spencer, who has used the fluid

extract for several years, regards it as a valuable styptic in haemorrhages, in doses of from 20 to 25 drops, and also as a substitute for ergot. He has found the drug valuable in the ineffectual or premature pains of labor, when patients often fall asleep as if under the influence of a narcotic. He further asserts that mistletoe may be used with advantage in the treatment of cardiac hypertrophy. He speaks of a case, where the pulse was weak and the extremities cold, that was relieved by doses of the drug, administered every two or three hours.

Monobromo-Acetanilid.—L. Worthington,² narrates 2 cases in which cyanosis followed the administration of monobromo-acetanilid, and to show the possible menstrual idiosyncrasy against its action, as suggested by a previous observer. The first case was that of a girl 19 years of age, who, after taking 14 grains (0.90 gramme) of the remedy in two doses, for the relief of a headache, exhibited, a few hours later, deep cyanosis of the lips, cheeks, and fingers; a small, soft pulse of 120; restlessness, continued headache, and a feeling that she was dying. In two hours more the pulse was 140 and small; complaint was made of a rushing noise in her ears, and the patient threw herself about restlessly, like one who has lost much blood. These symptoms were observed at about 12 o'clock at night. By 6 o'clock next morning, in attempting to get out of bed, she fainted, but after this circumstance the cyanosed condition began to diminish, the headache to disappear. At 6 in the evening the cyanosis was still appreciable, but during the night menstruation came on, and the girl quite recovered by the following morning. The second case was that of a woman 33 years of age, who had previously taken antifebrin, with apparent benefit, for the relief of headache. Eight grains (0.53 gramme) of the monobromo-acetanilid were taken by her this time, in two equal doses. By next morning her headache was relieved, but she was faint and blue, and staggered on attempting to walk; her pulse was 80, not small, but soft and regular. Ether and ammonia were administered, and by night the cyanosis and headache had disappeared and menstruation had come on. Menstruation was not due for ten days in the first case, but in this there existed previous irregularity. In the second case the menstrual period was due in three days.

Morrhuol C. Creasotum.—Germain Sée¹⁰⁷ considers codliver-

oil not only as a nutritive substance, but also as a digestive article, owing its virtues to the active principle which renders assimilable the carbohydrates and the fats ingested, and therefore of great value in the treatment of consumption by inducing hyper-alimentation. As a specific remedy for this wasting and intractable disease, one of the best drugs that have been tried is creasote, which may be looked upon as a powerful antiseptic and germicide, and much less dangerous than other agents when given internally. Thus, Sommerbrodt and Penzoldt, who have used it in some 5000 patients during a period of eleven years, warmly recommend it in such cases. Sahli, of Berne, has found that when the remedy is employed in the form of guaiacol (purest creasote) it diminishes the cough, eases the expectoration, and is of special value in the catarrhal stage of the disease. Capsules containing 3 grains (0.20 gramme) of codliver-oil and 1 grain (0.07 gramme) of pure beechwood creasote in each have given the happiest results where there is tuberculosis accompanied by defective nutrition. Lafage¹⁰⁷ believes, from clinical observations, that one of the most important facts about morrhuol creasote is its rapidity of action. Amelioration was produced in from eight to fifteen days, in which both the expectoration and cough were diminished and the appetite improved. The author remarked that *it should always be remembered that the consumptive who eats and digests his food is capable of being cured*; that the dose of the capsules referred to may be increased to six or more daily. This number represents 30 centigrammes (6 minims) of creasote and 90 centigrammes (18 minims) of morrhuol. The capsule should be continued for several months if the lesions of lung are serious and there have been cavities. The remedy induces solidification of softened pulmonary tissues, and prevents further formation of muco-purulent sputa, with a tendency to produce sclerosis of cavernous surfaces. The remedy is especially valuable in the treatment of pulmonary phthisis in the first stages, before the formation of cavities. It lessens and even cures cough, arrests the ravages of the bacillus and the wasting process, improves the appetite, diminishes the secretion of sputa, and raises the general tone of the patient. It causes no haemoptysis, but relieves dyspnœa, arrests night-sweats, and promotes general nutrition. It rarely produces nausea or other untoward symptoms.

Mussanin.—From the *Acacia anthelmintica*, a tree of Abyssinia, a new anthelmintic has been discovered by Thiel,¹¹³ to which he has given the name of *mussanin*. Its properties are said to be superior to those of kousso, while its taste is much more agreeable. An infusion of the powdered bark can be made, which can be given in doses of from 1 to 2 ounces (32 to 64 grammes).

Naphthalin.—A case of dysentery in which calomel, creasote, and corrosive sublimate were of no avail, yielded, according to Minerbi,⁵⁸⁹ to naphthalin in the form of suppositories, in the proportion of 1 gramme (15 grains) of naphthalin to 10 grammes ($2\frac{1}{2}$ drachms) of cacao-butter for each suppository. After the alvine discharge the drug was introduced into the rectum. The disease under this treatment was checked in six days. For dysenteric ulcerations of the large intestine Minerbi has employed, with advantage, rectal injections of naphthalin, according to the following formula :—

R Naphthalin,	5 parts.
Sterilized olive-oil,	200 parts.

This is to be injected at once by means of an ordinary syringe, to be repeated according to the severity of the case, especially if the tenesmus is very pronounced three or four times in the twenty-four hours. In some of these cases the author has administered internally a combination of 3 milligrammes ($\frac{1}{20}$ grain) of corrosive sublimate and 5 centigrammes ($\frac{1}{4}$ grain) of creasote during the day. The duration of the treatment was never more than two weeks, and under it 22 cases completely recovered. Minerbi has treated 11 cases of oxyuris vermicularis of children by naphthalin in injections of 1 gramme (15 grains) to $1\frac{1}{2}$ grammes ($22\frac{1}{2}$ grains) of the drug to 50 or 60 ($1\frac{1}{2}$ to $1\frac{7}{8}$ ounces) of olive-oil. Cure was obtained usually in less than eight days of treatment. According to Morgan Dockrell,²⁵ the employés in the gutta-percha works, where naphthalin is used to clean out large coppers, experience a new form of drunkenness. The sensations produced are said to be so delicious as to surpass those from opium or haschish.

Naphthol.—A. Irwin Bolton⁶ reports the successful treatment of a case of typhoid fever by the use of beta-naphthol, in doses of 4 grains (0.25 gramme) each every third hour. The medicine was given in capsules. The severe symptoms at once began to ameliorate, and the patient finally entered into convalescence, which

ended in recovery. The drug is spoken of as also useful in summer diarrhoea and dysentery.

Naregamia.—The tincture of *Naregamia lata*, made by extracting layers of the skin of the plant with alcohol, has been used as an expectorant by Stefan Schoengut², with excellent results. The plant is a small shrub, with somewhat pendent branches and triple-pointed leaves; the flowers are white and elongated, about 1 inch in length. The active principles are found in greater abundance in the cortex of the branches. The cortex, when rubbed up, yields a light-brown powder of pungent, aromatic, and nauseous taste. The powder contains oil, sugar, resin, and several other bodies, and, according to Hooker, an alkaloid, *naregamia*, an amorphous powder, which, however, forms crystalline salts with sulphuric, nitric, and hydrochloric acids. The plant contains no tannic acid. In India it is used in bilious disorders. Biddie, of Madras,², tried it in dysentery and in respiratory troubles. It is thought to resemble emetin in its action, and it influences directly the glands of the bronchial tubes. The alimentary canal appears to be unaffected by the drug, though vomiting has been observed in one case. The plant has no action on the urine. Schoengut states that the tincture of the drug has been employed in the clinic of Drasche, of Vienna, in 24 cases. The remedy was found useful as an expectorant, especially in those cases in which there was much coughing with little expectoration, or when this was made difficult by thick, tenacious mucus. In 2 cases of fatty heart, complicated with catarrh of the air-passages, the tincture of the drug proved efficacious. The same results were obtained in cases of pulmonary emphysema. The remedy promoted expectoration in tuberculosis, and the same effects were observed in cases of pneumonia, especially in the stage of resolution with copious crepitant râles. The drug did not seem to have any effect on the circulation or digestion, and was usually well borne. No toxic symptoms were observed. The remedy was used in doses of from 1 to 3 grammes ($\frac{1}{2}$ to $\frac{2}{3}$ drachm) daily, according to the following formula:—

- B. Tinct. naregamia, . . . 1.0 to 3.0 grammes ($\frac{1}{2}$ to $\frac{2}{3}$ drachm).
Aq. laurocerasi, . . . 10.0 to 20.0 grammes ($2\frac{1}{2}$ to 5 drachms).
M. Sig.: Ten drops every hour.

Nettle.—The dried leaves of the common nettle, *Urtica urens*, has been highly recommended as an excellent remedy for asthma

and other bronchial affections by V. Szyszlo.⁵²⁰ The author cites several cases, one of them being his own, where relief was rapidly produced through inhalations of the drug when other means had entirely failed. Eight grains (0.53 grammes) of the leaves should be burnt, and the fumes inhaled every day at bed-time.

Nitrite of Amyl.—Alexander P. Rüdsky^{530, 109} describes a most interesting case of poisoning by cocaine, in which nitrite of amył proved to be a successful antidote. A healthy lady of 30 years of age took 1 grain (0.07 grammes) of hydrochlorate of cocaine for the relief of a headache. Ten minutes afterward there came sudden weakness, pallor of the face, and dizziness. These symptoms were soon followed by cyanosis, tremor, dyspnoea, almost imperceptible pulse, dilatation of pupils, disturbances of sight and hearing, cutaneous anaesthesia, and low delirium. A drachm (4 grammes) of ipecacuanha, administered under such circumstances, produced no vomiting, and the patient continued from bad to worse. Nitrite of amył was then resorted to, through inhalations by means of a handkerchief, this being about forty minutes after the taking of cocaine. Almost instantly the cyanosis and pallor of the face disappeared, respiration became freer and the pulse fuller and slower. An hour afterward a relapse occurred, but was again immediately relieved by inhalations of the nitrite of amył. All the symptoms, with the exception of some weakness, disappeared in about eight hours. Twelve drops, in all, of the amył nitrite were inhaled, and for internal administration, as adjuvants, wine and infusion of black coffee were given. Recovery finally took place.

Nitro-Benzol.—Taken by accident,²² the drug produced, upon man, cyanosis and unconsciousness. A girl, who had drunk about a teaspoonful of a liquid preparation, experienced a burning sensation in the mouth, throat, oesophagus, and stomach. Vomiting came after taking some milk, and continued until unconsciousness was established. This condition lasted for four hours, and there were attacks of convulsions of a clonic and tonic character. When consciousness returned, the patient appeared somewhat stupid, and presented a condition of cyanosis, with blue lips and livid face, pupils slightly contracted and reacting very badly to light. She complained of pain in the epigastrium. Camphor was administered hypodermatically, and spontaneous vomiting soon occurred,

which was assisted by the ingestion of warm water and tickling the fauces with the finger. The expired air and the matter vomited had a distinct odor of bitter almonds. Coffee and cognac were administered during the night, and, although there was a decided improvement by next morning, headache was very severe, with a tendency to a rise in the temperature; 101° F. (38.33° C.) was noticed on one occasion. In a week's time the improvement was marked, as the patient's lips had acquired their normal color. The microscope showed no changes in the blood, but the spectroscope revealed an ill-defined absorption band between the normal absorption bands. The urine contained some urobilin, a large amount of indican and acetone, and gave no reaction for albumen or sugar.

Nitrogenous Metabolism. — The influence of digitalis and nitrate of potassium on the nitrogenous metabolism in healthy subjects has been studied by G. P. Serejnikoff¹⁰⁰⁹ in 4 subjects, aged from 30 to 34. In 3 of the cases the experiments lasted twenty days and in the fourth twenty-four days. The diet of the patient consisted of lean roast beef, fatless beef-tea, bread and butter, tea, sugar, chloride of sodium, and water. The author's conclusions are summarized as follows: 1. The action of digitalis on the nitrogenous metamorphosis in healthy people, in quantitative regards, is rather inconstant, but the remedy tends to increase the metabolism on an average of about 8.15 per cent. 2. In qualitative attributes the drug constantly and distinctly improved the metamorphosis, oxidation of nitrogenous substances proceeding more perfectly. 3. The effects are but short-lasting, being limited only to the period of the administration of the drug. 4. The action of nitrate of potassium is still less constant. 5. In such cases, where the action of the drug is apparent, the nitrogenous metamorphosis increases on an average of 2.7 per cent. 6. In a majority of cases the potassic salt improves the metabolism in qualitative regards. 7. Neither digitalis nor nitrate of potassium appears to have any distinct influence on the assimilation of nitrogenous constituents of food. A. J. Alexeëvsky,¹⁰⁰⁹ in studying the influence of digitalis and nitrate of potassium on the metabolism of water, has found that (1) both of the drugs augment the elimination of water through the kidneys and diminish aqueous losses through the skin and lungs; (2) the metamorphosis of water, however, is not increased by digitalis, and undergoes but a

slight increase under the influence of nitrate of potassium; (3) both of the drugs raise the arterial pressure.

Nitro-Glycerin.—C. D. Palmer,⁵³ asserts that he has cured a case of heart trouble with this drug. The patient had a fatty organ, whose action was irregular and feeble, but there was no valvular lesion. A drop of a 1-per-cent. solution, three times a day, was administered and gave immediate relief. A woman 65 years of age, with an irregular heart, very bad general condition, and almost dying from uræmic poisoning and cardiac failure, was relieved, according to J. L. Cleveland, by the administration of drop-doses every hour of a 1-per-cent. solution of nitro-glycerin. Next morning the patient had recovered from the drowsy condition and the kidneys resumed almost their normal function. Another case is reported, apparently saved by the use of this drug. A boy, 10 years of age, suffering from typhoid fever, suddenly became unconscious, and remained in this condition for seventy-two hours. When seen he was apparently dying; the pulse was almost imperceptible, extremities cold, and there was an upward and downward movement of the *pomum adami*. Notwithstanding that the patient had been taking drop-doses of a 1-per-cent. solution of nitro-glycerin every few hours, the prognosis was given as inevitably fatal. However, two hypodermatic injections, of 1 drop each, of a 1-per-cent. solution were administered, and in the course of an hour afterward all the symptoms began to abate, and the boy finally recovered. The drug has been found of great service, by B. W. Allen, in a case of collapse caused by a second attack of pneumonia. The patient, a woman, under this second attack, presented the following symptoms: pulse almost imperceptible at wrist; heart-beat very weak and accelerated; skin cyanosed and moist, accompanied with a cold, clammy perspiration. Her breathing was not accurately observed, owing to the constant effort of the patient to talk to those around her. The drug, under such trying circumstances, was immediately resorted to. A hypodermatic injection of 5 drops of a 1-per-cent. solution was given at once, and five minutes afterward the heart-beat was much stronger and the pulse could be perceived at the wrist. The surface of the body gradually regained its normal warmth and color, and three hours later all the symptoms were much better. The collapse noticed in this case resembles so much that produced by railway shock, as described by certain writers,

that the author ventures to suggest the use of the drug in the treatment of the latter trouble. A case of gas asphyxiation, successfully treated by hypodermatic injections of nitro-glycerin, has been reported by C. W. Goss.⁶¹ The case was that of a plumber, 40 years old, who in some way was entirely overcome by the gas escaping from a pipe. When first seen by the physician, the patient was cyanotic, had shallow and spasmodic respirations, no pulse at wrists, cold extremities, and there was a condition of profound unconsciousness. Hypodermatic injections of nitro-glycerin, in doses of $\frac{1}{100}$ grain (0.00065 gramme), were given every ten minutes. Half a minute after the first dose the pulse began to be noticed at the wrist and grew gradually stronger, and at the end of fifteen minutes consciousness had returned and the patient expressed himself as being quite well, with the exception of a numbness in the extremities. At the end of three hours he went to his home. No artificial respiration was used in this case, but it was noticed that breathing improved *pari passu* with the increase in the volume of the pulse, from which it can properly be deduced that the prime medication in such cases is to establish the action of the heart.

J. C. Crossland⁵³ reports an interesting case of poisoning by illuminating-gas. The patient, a strong young woman, when found (9 A.M.), presented the following symptoms: respiration stertorous, shallow, and abounding in mucous râles; frothing at the mouth; pulse almost imperceptible; eyes partly open, fixed, staring, and insensible to touch; pupils moderately dilated, not reacting to light; conjunctiva congested; face purple, and limbs cold. Patient was apparently moribund; fresh air and stimulants and even electricity produced no good results. Nitro-glycerin was resorted to. Fifteen minimis (1 gramme) of the drug were injected into the epigastrium. The good effects on the action of the heart were seen in about five minutes, and the hypodermatic injections of nitro-glycerin were continued at intervals varying from half an hour to two hours, according to indications. At 3 P.M. collapse was imminent and death seemed to be the inevitable result. Twenty minimis (1.30 grammes) more were injected into the epigastrium and the battery-poles applied to regions along the track of the vagi. In one hour the patient appeared much better. By 3 A.M. she was conscious enough to mutter the word "don't" in protest to the use of the battery. By 4 A.M. she expressed a desire

to defecate, but the bowels did not move; this tenesmus was finally subdued by a hypodermatic injection of morphia into the perineum. Recovery took place subsequently, though headache, nausea, and muscular weakness were experienced by the patient for one or two days after the accident. The antidotal powers of nitro-glycerin in this case may be attributed to the stimulating properties of the drug. A case of poisoning by overdosage with nitro-glycerin has been published recently. A woman, by mistake, took 2 drachms (8 grammes) of a 1-per-cent. solution of the drug. The symptoms produced were incomplete loss of consciousness, pallor, dyspnœa, cold extremities, and nausea. There was some slight exhilaration at first, but the pulse, strong and regular, continued to beat 80 times per minute. Distress in the gastric region was experienced. Recovery took place under proper medical treatment, though the condition of the patient suggested a fatal issue. The woman, when fully restored, stated that she partially remembered especially the dyspnœa and the stomach distress that she experienced when under the full influence of the drug.

Nitromuriatic Acid.—A case of jaundice, successfully treated by nitromuriatic acid, has been reported by E. C. Kline.¹⁹⁹ The following formula was employed:—

R. Acidi nitromuriatici,	fʒij (8 grammes).
Acidi sulph. arom.,	fʒij (8 grammes).
Syr. aurantii cort., q.s. ad	fʒiij (96 grammes).
M. Sig.: Take a teaspoonful three times daily in a wineglass of water.	

Nutmeg.—P. B. Bentli²⁰⁰ reports a case of poisoning by nutmeg. The patient presented the following symptoms: Pain in the head, great thirst, mouth and tongue "parched," and numbness of the limbs. He was unable to stand, but could be roused to answer questions when talked to in a sharp manner. Pulse regular, beating 70 times per minute; temperature normal; pupils somewhat contracted, but acting to accommodation and light. His tongue was clean and dry and his heart-sounds normal. It was ascertained that his wife had administered to him, the night previous, a whole grated nutmeg in milk, as she had been advised that the drug was a good remedy for boils, of which her husband had some on his neck. The treatment consisted in the administration of 10 grains (0.67 gramme) of calomel at once, followed, two hours later, by an ounce (32 grammes) of castor-oil. The

patient was quite well by the next day, but complained of a slight headache.

Nux Vomica.—Hutchinson⁸⁰⁶ states that overdoses of nux vomica are often followed by no marked untoward effects. He cites 1 case of a man 33 years of age, who, by mistake, had taken 40 minims (2.67 grammes) of the tincture, and the only symptoms produced were heavy eyes and general dullness; a feeling "as if I had been drunk overnight," as the patient expressed it himself. No muscular twitchings were observed. A second case is referred to by the same author in which a person took 40-minim (2.67 grammes) doses of the tincture of the drug, continuing it three times a day for four doses in succession. As in the first case, there was a dull feeling in the head, but no twitchings; on the contrary, he felt "wonderfully better for it." Hutchinson believes the tincture to be a safer preparation than any of the solutions of strychnia, as it has the advantage of not exciting alarm in the patient and of being taken for months without diminishing in its efficiency.

Oleates.—G. M. Beringer²³⁷ describes the different methods of preparing the oleates which are commonly used in medicine. He advises that oleic acid be saponified with an alkali rather than by Castile soap, as proposed by J. V. Shoemaker and H. B. Parsons.

Oleum Chænoceti.—This oil is derived from the *Balaena rostrata*. According to Gustav Guldberg,¹⁰⁹ it has a lower specific gravity than any other animal oil and possesses penetrative properties. It is especially indicated in cases in which it is desired to promote rapid absorption of remedial agents. A mixture of the oil and chloroform acts rapidly upon the skin and very efficiently on the peripheral nerves, being, therefore, useful in all forms of neuralgia, pruritus, and other local trouble. An ointment may be made with white wax, 2 parts of this to 8 of the oil. The drug is cheaper than olive-oil and superior to more expensive oils. The crude substance is unfit for use on account of its disagreeable smell.

Olive-Oil.—Siegfried Rosenberg¹¹⁶ has collected from the literature on this subject 21 cases in which gall-stones were treated by the use of oil. Of this number 19 were improved or cured; in the other 2 the treatment failed. He adds 3 cases of his own in which the administration of repeated doses of 100 to 180 grammes

(3½ to 6 ounces) of olive-oil, combined with a little menthol, produced the best results. From experience on artificial biliary fistulæ of dogs, it was found that the administration of fat increased the quantity and diminished the specific gravity of the bile. In the discussion caused by Rosenberg's paper, Ewald¹¹⁶ stated that in his experience even large doses of the remedy in question failed to produce good results in the treatment of gall-stone colic, although relief could sometimes be obtained.

Opium.—Dujardin-Beaumetz⁸⁰ states that "we may almost lay it down as a rule that any patient who for thirty consecutive days takes morphine will ever after be a victim to that habit, even when the symptoms of the primary malady shall have completely disappeared." H. R. Bramwell⁶ refers to the case of an infant 3 months old, who had been given by mistake a teaspoonful of laudanum, the characteristic-symptoms of opium poison following very rapidly, in spite of the vomiting that occurred soon after the ingestion of the drug. Strong coffee was ordered immediately by mouth and rectum, and $\frac{1}{40}$ grain (0.0016 grammes) of atropia injected hypodermatically. No emesis was produced by ipecacuanha, mustard and water, or tickling of the throat, but it was advised to keep the child awake at night. Recovery followed by next day. The case of a child 4 weeks old, who, by mistake had been given a powder containing $\frac{1}{2}$ grain (0.013 grammes) of morphine, is reported by James R. M'Carroll.¹⁶¹ When first seen, at 2.50 P.M., the little patient was in a profound slumber. Attempts to produce vomiting were of no use, and the ingestion of mustard in warm water by means of a spoon had no effect. Whisky was administered in water, followed by 4 drops of the tincture of belladonna. The baby grew worse by 3.30. A hypodermatic injection of 20 drops of whisky and 3 drops of the tincture of belladonna was then given. The injection of 20 drops of whisky alone was repeated every half hour until 5 o'clock, and 3 more doses were administered by 1 o'clock in the morning. In the mean time electricity was used, but the final recovery was attributed to the stimulating effects of the alcohol employed. J. M. Swan¹⁶¹ has reported a case of opium poisoning in a soldier, saved by hypodermatic injections of atropia sulphate. The patient, aged 36, with suicidal intent, had taken 675 minims (43.73 grammes) of the aqueous extract of opium. Three hours afterward all the symptoms of the third

stage appeared: profound coma, slow respiration (8 to 10 per minute), pupils contracted to a pin-head. After the usual measures of evacuating the stomach and the ingestion of brandy, a few $\frac{1}{4}$ grain (0.0027 gramme) doses of atropia were administered hypodermatically. No effect seemed to be produced, and the patient was rapidly sinking; his respirations were lowered to 3 per minute, the pulse became imperceptible at the wrist and the cyanosis deepened. Under such critical circumstances the doses of atropine were increased to $\frac{1}{2}$ grain (0.0054 gramme), aided by artificial respiration and hot applications. After three injections of the atropia salt in the amount last mentioned, a change was produced. Respirations gradually rose in number and the pupils began to dilate. Breathing continued to improve, and the patient by the third day had completely recovered. Three-fourths of a grain (0.05 gramme) of atropine sulphate were employed in all, and it was only this enormous dose of the alkaloid that prevented a surely fatal issue.

George C. MacLean,⁹⁹ reports the case of a young man 23 years old, who had taken, with suicidal intent, more than 1½ ounces (48 grammes) of laudanum. When first seen, at 3.30 A.M., all the symptoms of poisoning were present: complete coma, stertorous respiration, pupils contracted to a pin-hole, face dusky, lips and tongue nearly black, pulse full and slow, and cold extremities. No vomiting had taken place. The stomach-pump was used, and the organ washed out first with warm water and afterward with hot black coffee. Three hypodermatic injections of atropine sulphate, of $\frac{1}{30}$ grain (0.0021 gramme) each, were administered at intervals of half an hour. No improvement followed, and the patient, by 5 o'clock, seemed worse and had entirely ceased breathing. Artificial respiration was then resorted to with success. By 8 o'clock consciousness began to return, especially under persistent shaking, rolling, and shouting. The patient made a final recovery, the good results being attributed chiefly to the stimulating effects of coffee. J. R. Loyan,^{100,117} reports the successful recovery of a baby poisoned by morphine, through the sole action of electricity. The child, only 6 days old, was poisoned by a dose of 2 or 3 drops of Magendie's solution, given by a nurse to quiet restlessness. When first seen the extremities were cold and blue, and no respiration or heart-beat could be detected. After ten

minutes' application of artificial respiration and electricity by means of a faradic battery, only a feeble, gasping inspiration was noticed, and shortly afterward the heart had begun to beat. The cardiac action continued, but respiration was only induced by the electric current. The battery was applied for more than thirteen consecutive hours before natural respiration was established, and this faradization was the only remedial measure that could be employed under the circumstances. The child finally recovered. A case is reported by Lemoine,²³⁰ where the antidotal powers of atropine against the action of morphine were observed. The patient was a woman 25 years of age. Under the influence of delirium and acute excruciating pain, she had taken, hypodermatically, from 10 o'clock A.M. to 3 P.M., in divided doses, 28 centigrammes ($4\frac{1}{2}$ grains) of the hydrochlorate of morphia. By 2 o'clock the following morning the woman complained of a bad headache, general malaise, and her pupils were reduced to a pins' point. She was then under the full action of the narcotic. A hypodermatic dose of 2 milligrammes ($\frac{3}{100}$ grain) of the neutral sulphate of atropia was administered immediately; two minutes afterward a great improvement was noticed; the pupils began to dilate, and by 11 o'clock they assumed their normal size. The patient eventually recovered. No other measures appear to have been employed. A case of considerable interest is reported to show the antidotal powers of morphine in atropine poisoning. A medical student, by mistake, took 6 grains (0.40 gramme) of atropia by the mouth, and in a few moments became unconscious and fell. Emetics were instantly administered and the stomach-pump applied, but the patient continued to sink very rapidly. The pupils were widely dilated, and there was foaming at the mouth, stertorous respiration, and a rapid, intermittent pulse. One grain (0.07 gramme) of morphine was administered hypodermatically with no apparent effect; the patient seemed nearing the end. Another injection of a grain followed, but no decided effect was produced. Dissolution seemed to be inevitable. Artificial respiration was resorted to, and applied from 8 o'clock in the morning till 3 in the afternoon. The results were still unsatisfactory. A third injection of 1 grain (0.07 gramme) was now tried, and this seemed to prove efficacious. In an hour longer the pulse improved, the respirations gradually returned to normal, and consciousness was soon established.

J. N. Hall reports a case of a man who had taken about 30 grains (2 grammes) of the drug, in the form of pills, and no symptoms whatever were produced within about two hours. With the simple use of emetics the patient was relieved of the drug taken, and eventually got well without ever having exhibited any untoward effects. G. H. R. Dabbs,²⁴¹ believes that the morning sickness produced by the continuous hypodermatic use of morphine can be easily destroyed by combining $\frac{1}{3}$ grain (0.02 gramme) of cocaine with the solution of morphia. He mentions a case under observation where the morphine has to be steadily increased, and even there the results produced by cocaine are seen. L. Bremer²⁴² describes 2 cases where the continuous use of hypodermatic injections of morphia has been followed by emphysematous gangrene or malignant oedema, as it has been more recently termed. These results were, of course, not produced probably by the action of the drug, but through infection introduced by the syringe, as it has been found that the inoculations only prove successful when done by the hypodermatic syringe. In the 2 cases reported, in all probability, the bacillus of malignant oedema was introduced into the system by the syringe. L. H. Labreyne¹¹⁹ relates the case of a young tuberculous man, who, during a period of 18 months, took increasing doses of the sulphate of morphia until 35 grains (2.33 grammes) a day, in two injections, were tolerated without producing any disturbance of appetite.

From a study of the effects of the prolonged use of morphia, L. Reynier,¹⁰⁰ arrives at the following conclusions: (1) The opium habit may be the consequence of an inevitable therapeutic necessity, or the effect of a pathological craving, the origin of which is in the temperament of the subject. 2. The difference in the cause leads to a difference in the symptomatic expression. In the one case the intoxication is free from all accessory elements; in the other there is added the element of a specially morbid appetite. 3. Morphinized individuals are distinguished from morphinomaniacs by an absence of psycho-sensorial phenomena and especially grave symptoms on the suppression of the drug, such as occur in morphinomania, which is characterized by a sensation of craving, the almost constant presence of a hereditary or acquired nervous condition, of a physical or psychical taint of degeneracy, and symptomatically by an admixture of psycho-sensorial phe-

nomena, as manifested in pure and simple morphia intoxication. 4. In the morphinomaniac the suppression of the drug produces special phenomena, the intensity being in proportion to the size of the doses employed and the duration of the habit. 5. Morphia drunkenness cannot be regarded as capable of producing a state of unconsciousness, or provoking irresistible impulses. 6. Morphia intoxication rarely causes a state of mental failure sufficient to determine the complete loss of responsibility; it never produces irresistible impulses. 7. It may lead to manifestations of a mental condition, in the course of which irresistible impulses are possible. It then produces effects important from a medico-legal point of view. The mental state developed in morphinomania, through abstinence or the more or less prolonged delay in the ingestion of the drug, must, then, be taken into consideration in order to appreciate the responsibility of such patients. 8. Morphinomania is a grave affection, not only from an individual, but also from a social and medico-legal stand-point. It is tenacious, rebellious to treatment, and easily recurs. 9. In the inveterate morphinomaniac treatment is not generally efficacious and cure not generally maintained. A complete definite cure is rare, except in cases of recent date, and which do not produce any nervous, hereditary, or acquired defect.

Orexin hydrochlorate is the name of a new stomachic introduced by Penzoldt,¹¹⁶ and held by him to improve the gastric function and the appetite. It is the phenyldihydrochinazolin, and the salt is perfectly soluble in water. It has been found to produce a powerful sensation of hunger, hastening the appearance of free hydrochloric acid in the gastric juice and the disappearance of food from the stomach. It has done good in anorexia after operations, and in phthisis it has improved the appetite. It was found of especial service in those diseases where simple anorexia, without other disturbances of the stomach, is present. The dose is from 5 to 8 grains (0.32 to 0.53 gramme), once or twice a day, in pill form.

According to Ed. Egasse,⁶⁷ 5 milligrammes ($\frac{1}{2}$ grain) to 2 centigrammes ($\frac{1}{2}$ grain) of chlorhydrate of orexin, given to frogs, paralyzes the motor nerves of peripheral origin, when death ensues. The blood was dark-colored. In warm-blooded animals it does not manifest any caustic action either on the conjunctiva, the mucous membrane of the stomach, or the subcutaneous tissues.

In rabbits, hypodermatic injection of 5 centigrammes ($\frac{1}{4}$ grain) per kilogramme ($2\frac{1}{2}$ pounds) of body-weight produces no toxic effect; in doses of 25 centigrammes (4 grains) it causes toxic phenomena, trembling spasms (clonic and tonic), enfeebling of the respiration and of the cardiac muscle; and, in the dog, vomiting. Several hours after, the animal regains normal state. Thirty centigrammes ($4\frac{1}{2}$ grains) per kilogramme of weight induce in the rabbit only passing symptoms of paralysis. It destroys red blood-corpuscles, produces methæmoglobin, and blood becomes deep red in color. As would be inferred from its relation to quinoline, orexin possesses anti-microbial properties. In solution, 0.20 for 100 retards putrefaction of blood, but has no action on the development of pathogenic microbes, such as the staphylococcus pyogenes. Doses of 1 gramme (15 grains) produce symptoms of intolerance, characterized by malaise, feebleness, and congestion of the face; doses of 50 centigrammes ($7\frac{1}{2}$ grains) or little more increase remarkably the appetite. Hugo Glückenziegel¹¹³ has used this drug in several cases with varied results. He gave it in pill form, each pill containing $1\frac{1}{2}$ grains (0.10 gramme) combined with the extracts of marsh-mallow and gentian. Of these pills a healthy medical student took three daily for four consecutive days. The effects were negative in every way. The drug was then tried in 17 cases of anorexia. In 2 of these appetite improved on the first day; in 4 on the second day; in 3 no improvement followed after some time, but vomiting was produced. In one case of heart disease the remedy produced pain in the stomach, which disappeared on suspension of the drug. After treatment by orexin was suspended 7 of the patients exhibited a normal appetite, which was decidedly improved in 4 of them. According to Glückenziegel, therefore, the new remedy may be of value in cases of dyspepsia. George Miller¹¹⁶ has given this substance, in from 3 to 7 grains (0.20 to 0.47 gramme), during the day, to patients suffering from various disorders, but in which the persistent loss of appetite was the most prominent symptom. The cases were 5 in number: vomiting, diabetes, intestinal tuberculosis, phthisis, and diarrhoea. Not the slightest improvement was noticed in any of the cases. No disagreeable effects were observed. W. F. Waugh¹¹⁰ reports 4 cases of anorexia from various causes treated with daily doses of $1\frac{1}{2}$ grains (0.10 gramme). Of these cases only one was apparently benefited. Four other cases were subjected to

doses of from 6 to 12 grains (0.40 to 0.77 gramme) during the day, improvement being observed in 3 of them. No untoward effects were noted.

Imredy⁵⁰⁰ has employed the drug according to the manner recommended by Penzoldt, but with negative results. Twelve cases were treated, and not only was the appetite not improved, but in some of the cases nausea and vomiting were produced. Of 35 different cases treated by Martins,⁵⁰¹ in only 5 was there noticed some improvement of the appetite. The method employed was identical with that recommended by Penzoldt. Edward Reichmann tried it in 36 patients in quantities of from 4 grains (0.25 gramme) once or twice daily to 7½ grains (0.50 gramme) at a single dose, care being taken to avoid any psychical influences. A distinct improvement of the appetite was produced in 5 cases, and a less marked influence in 11 patients. No effect was observed in 24 cases, while in a few instances nausea and vomiting were produced, though not of a serious nature. The contents of the stomach in 6 of the cases were examined, and, in confirmation of Penzoldt's statement, there was noticed an increase in the amount of hydrochloric acid. Podgorski⁵⁰² finds, as the results of experiments made in the hospital, that orexin produces an increase in the amount of the hydrochloric acid of the gastric juice. He claims that in certain cases it caused improvement of the appetite, in some vomiting, but in the majority of instances its effects were negative. Of 12 cases treated by Belalmrèdi,⁵⁰³ 7 had their appetites improved, but in 5 no benefit resulted under the influence of the new stomachic.

Orthin.—A new antipyretic under the name of orthin has been introduced by Kobert.⁵⁰⁴ The drug is a combination of hydrazin with para-oxybenzoic acid, and, according to this author, is free from toxic properties. Orthin is soluble in water, but is an unstable body. The hydrochlorate, however, is a permanent compound, when protected from light. The watery solution is colorless and possesses extreme reducing powers toward oxides of the heavy metals. It reduces Fehling's solution even in the cold. It has antiseptic powers. It is said by Kobert not to be poisonous to cold- and warm-blooded animals. Fifteen grains (1 gramme) of the drug given to a dog weighing 20 pounds produced no untoward effects. The urine of all animals reduced Fehling's solution even in the cold. The same amount produced sugar in

the urine of a goat, but no other evil results. In the proportion of one to a hundred thousand in the blood, the salt produces muscular-vascular dilatation, but no alteration whatever in the blood itself, as shown by microscopic and spectroscopic analysis. On the other hand, Unverricht, who has tried the new antipyretic clinically, has found that the hydrochlorate of orthin in doses of $7\frac{1}{2}$ grains (0.50 gramme), given in cases of typhoid fever, scurvy, pneumonia, and acute rheumatism, while reducing the temperature, produced, nevertheless, profuse sweating and even collapse, and other symptoms of poisoning. In some instances no effects were observed under the above doses, while in others 3 grains (0.20 gramme) of the salt were sufficient to cause marked depression. In several cases even comparatively small doses produced remarkable oscillations in the temperature. By mistake 30 (2 grammes) instead of 3 grains (0.20 gramme) were administered in 2 cases, and in both severe vomiting occurred without affecting the temperature. The drug was also tried as an analgesic in cases of rheumatism and neuralgia, but no good results were obtained, and sometimes its administration was followed by a marked chill. A medical student took only $1\frac{1}{2}$ grains (0.10 gramme) for neuralgia, the use of the remedy being rapidly followed by dizziness, cold sweating, and nausea. Locally in cases of psoriasis it was employed, but was found inferior to chrysarobin. Kaufmann⁴ warns against its use.

Ovarian Juice.—Brown-Séquard⁴¹⁰ continues to report his results with the use of injections of watery extracts of the ovarian fluid. He refers to the experiments of Villeneuve, and cites the case of a woman, suffering from hysteria, where double salpingotomy did no good, but where a cure was obtained under injections of ovarian juice! He speaks of an American lady who has tried patiently the ovarian injections, with the happiest results. These experiments have been made upon a dozen women suffering from various uterine troubles. In all of them good effects were obtained, especially in one where a complete return of vocal power was produced in an old lady who had lost her singing-voice.

Oxygen.—Samuel S. Wallian,⁸⁰ attributes the failures observed from the use of oxygen to various causes, and to many conditions under which the gas may be devitalized by the imperfect processes employed to evolve, store, and use it. To avoid such failures, oxygen should be freshly prepared, and the patients taught

or made to inhale the gas properly. The act of taking oxygen usually in vogue is too much hurried, and it follows from this that the required amount in most cases is not inhaled. To obtain good results patients should be instructed to perform properly the respiratory act. The chest being erect, or, perhaps, thrown a little forward, the lungs are to be filled to their fullest capacity, and the gas retained as long as possible, and finally expelled through the nasal passages. To accomplish still better results, the method should be combined with the practice of chest gymnastics by the patients, avoiding imperfect habits of breathing, impediments of dress, forced positions of the body, and a sedentary life. The undiluted gas should be given in quantities of from 800 to 1000 cubic inches at a single sitting once or twice a day. It is always better to use the gas well diluted, except in cases of asphyxiation, narcotic poisoning, syncope, and other serious emergencies. Better results will be realized from the diluted form than from the pure gas, since only about 25 per cent. of a given volume is really utilized at a given moment of inhalation. Another important point in regard to the subject is the administration of adjuncts to the gas. This method in many instances has produced very good results. The most effective adjunct has been the monoxide of nitrogen, which of itself is an oxidizing agent, producing, in diluted forms, exhilarating effects. Combined with oxygen, it acts as a synergist. Again, the ingestion of oxygen should not be restricted to the method of inhalation, and experiments have shown that the alimentary tract and cutaneous absorption are often more available and insure better results than is generally supposed. Thus, compressed oxygen in distilled water has given excellent results in gastric and intestinal disorders, such as vomiting, anorexia, gastric catarrh, and, in fact, all cases where there is inability to retain food in the stomach. Still better results have been obtained from the employment of a mixture of oxygen and the monoxide of nitrogen, in the proportion of equal parts of the two gases or 2 parts of oxygen to 1 of the monoxide. The author regrets that this method has not become more popular, and that some competent company or firm has not as yet ventured to prepare the mixture on a large scale for commerce. To obtain this mixture, distilled water should be used and made to receive the two gases under a pressure of from 100 to 150 pounds to the square inch. He discusses the method

of cutaneous administration, giving a description of the apparatus to be used in this connection; extolling, lastly, the advantages to be obtained, in this way, in the treatment of complicated skin diseases generally, and certain forms of scarlatina, diphtheria, small-pox, and other infectious diseases, and in all other states of general debility, accompanied by torpor or incompetency of the respiratory or digestive organs.

From a study of the therapeutic value of oxygen, G. Thompson²⁰⁰,₂₂₄ has arrived at some important conclusions: (1) In dyspepsia the gas controls the subjective symptoms; (2) it is effective in cyanosis by diminishing the frequency of the respiration and relieving the subjective dyspnoea; (3) oxygen is of value in the partial inflammation of the lungs due to various causes; (4) it is especially useful in the dyspnoeas of chronic Bright's disease, uræmia, pneumonia, capillary bronchitis, asthma, catarrhal bronchitis, congestion of the lung, and of the first period of œdema.

Ozone.—E. Freuny and Edward Bécquerel¹⁵³,₁₅₄ have instituted a number of experiments on the character of ozone, which has been considered as oxygenated water or as a new combination of azote and oxygen. Their conclusions are as follow: It appears from their researches that ozone was an allotropic modification of oxygen comparable to the allotropic states of phosphorus, sulphur, carbon, silicium, etc. They have therefore proposed to give to ozone the name of electrified oxygen, because it is in electrifying oxygen that ozone is most easily obtained. To demonstrate that ozone was veritably allotropic oxygen, they have prepared it by obtaining the oxygen from the most diverse processes, and recognized that this gas once electrified, was completely absorbed by such bodies as iodide of potassium, silver, mercury, etc., acting like oxygen endowed with a great activity.

Paraldehyd.—Paraldehyd has been employed by W. H. Flint,⁸⁰,₁₂₅ in 35 cases of insomnia, due to many diseases, in order to compare its effects with other hypnotics. Success was obtained in 72 per cent. of the cases treated, the doses administered ranging from 60 to 90 minims (4 to 6 grammes). In his studies of the drug, Flint found that paraldehyd acted like ethyl alcohol, producing sleep by influencing the brain, this sleep being preceded by a short period of excitement, during which there was an increase of reflexes. Larger doses paralyzed the spinal cord, abolished reflex

action, and finally arrested the respiration. It likewise exerted a paralyzing influence on the vasomotor centres. It produced, like nitrite of amyl, myosis, and also stimulated intestinal peristalsis. The temperature was not notably affected, although sometimes a slight diaphoresis was noticed. Small and especially large doses decreased arterial pressure and slowed the pulse. The drug did not seem to irritate the stomach, and, with regard to its employment in disease, it was contra-indicated in cases of cyanosis with depression of respiratory centres, as in the advanced stages of emphysema and cardiac dilatation, in painful disorders, gastric ulcer, and gastritis, or in pharyngeal and laryngeal ulceration. The remedy was likewise contra-indicated in insomnia dependent on acute and chronic melancholia, epileptic dementia, acute alcoholism, the opium habit, hypochondriasis, hysteria, neurasthenia, chronic gout, exhaustion from overwork, dyspnœa, or the cough of pulmonary troubles. It might be used in anaemia, but with caution, owing to the probability of its reducing the oxyhaemoglobin of the blood. The drug produced toxic effects, such as headache, nausea and vomiting, vertigo, and slight cerebral congestion. Large amounts produced deep sleep with anaesthesia, abolition of reflexes, and death from respiratory failure. Too large quantities, given continuously, caused tremor of hands, oedema, anaemia, delirium, and a condition resembling chronic alcoholism. Fatty degeneration of the liver was produced in a rabbit poisoned by comparatively large doses. The average dose for an adult was 1 drachm (4 grammes), but the remedy should be given neither subcutaneously nor by inhalations, as in both cases irritation is produced. The drug did not seem to have an accumulative effect. Its tolerance was not established. According to the report of the Therapeutic Committee, ⁸⁰ paraldehyd produced sleep in from five to fifteen minutes under single doses of from 40 to 60 minims (2.67 to 4 grammes) in 14 cases, in half an hour in 2 cases, and in one hour in 1 case. In most cases the sleep was wakeful and restless; in 1 case the sleep lasted three-quarters of an hour, in 1 two hours, and in another three hours; in 10 from three to six hours and in 1 twelve hours. With regard to repeated doses, it was observed that $\frac{1}{2}$ drachm (2 grammes) of the drug, administered every three hours, produced sleep within half an hour and lasted two hours; 20 minims (1.67 grammes) every four hours, during fourteen days,

produced better sleep at night only. In a case of mitral stenosis, 40 minims (2.67 grammes) on two nights gave two to five hours' sleep, but on the third night a similar dose had no effect; on the fourth, 1 drachm (4 grammes) gave good results, but it produced no effect on the sixth night. When the drug failed to produce sleep it caused a slight excitement.

Pennyroyal.—J. G. Marshall², speaks of a case in which *mentha pulegium* acted as a most powerful oxytocic. Three drachms (12 grammes) of the essence of pennyroyal were sufficient to produce abortion, with symptoms of collapse. A. D. Leith Napier believes the drug to be used very freely by married women to hasten delayed periods, and refers to a case where the remedy usually produced the desired effects in three days. According to the same writer, pennyroyal is extensively recognized as a tolerably certain abortifacient, and less dangerous than other remedies, such as ergot, savine, cantharides, borax, and others. The drug is claimed by D. R. Campbell⁸⁰¹ as an excellent remedy in the treatment of suppressed lochial discharges, which always return after drinking a tea of the plant as hot as possible. The infusion has caused the appearance of suppressed menses in the course of twenty-four hours; and in amenorrhœa, the employment of the drug, together with the application of hot foot-baths, has usually been followed by the desired effect. Campbell believes the drug to be free from deleterious properties.

Phenacetin.—According to Colischonn⁶¹, phenacetin in large doses is superior to salicylic acid in treatment of rheumatism. The author himself once took 120 grammes (4 ounces) of salol in the course of three weeks, and received no benefit; while 4 grammes (1 drachm) of phenacetin, taken in two doses in the afternoon, and for a period of two days, were sufficient to relieve an attack of musculo-articular rheumatism in his own person. This drug was usually well borne by the digestive organs. The author has employed it in other cases with the same good results. In only a few, profuse sweatings, the only untoward effect produced, was noticed after the administration of four doses of a gramme (15 grains) each. Under the use of the drug the normal temperature was sometimes lowered from $\frac{1}{2}^{\circ}$ to 1° by the second or third day, while fever was always promptly abated; the pulse was reduced from 10 to 15 beats. From an extensive trial of the remedy,

Colischonn found that phenacetin produced 19 cures out of 29 cases of acute rheumatic polyarthritis *with* fever; 12 cures out of 19 cases of acute rheumatic polyarthritis *without* fever, but with swelling of the joints; 8 cures out of 12 cases of muscular rheumatism without fever; 2 cures out of 10 cases of muscular-articular rheumatism without fever; so that the drug appears to act most efficaciously in acute articular rheumatism. The author, however, recommends the drug to be used in every case of rheumatism in doses of from 1 to 4 grammes (15 grains to 1 drachm) as a trial. Dujardin-Beaumetz⁸⁰ thinks that the reason why phenacetin possesses non-toxic properties is due to the fact of its being so slowly absorbed. From experiments on man and animals, Moncorvo,²⁸ finds that phenacetin possesses no haemostatic powers.

William Terry⁴⁹⁵ has found the drug very efficient as an analgesic. He has tried it with success in a case of cancer, and in many instances of headache, from whatever cause; as also in neuralgia, rheumatism, dysmenorrhœa, painful ulcers, and others. He refers to a case of rheumatic pains in a young man, where 18 grains (1.20 grammes) of phenacetin in a single dose, produced permanent relief in a little over an hour. He likewise speaks of cases where sulphonal could produce sleep only after the previous use of phenacetin given to relieve pain. In the treatment of 314 cases of influenza, during the last epidemic, J. Frederick Haller⁹⁹, asserts that he has obtained the best results from the use of phenacetin, this drug cutting short the duration of the disease, removing the pains, and causing a free expectoration and rapidly-diminishing cough. After the use of a laxative with a cholagogue, he would employ the following:—

R. Salol,

Phenacetin, 25 gr. iiss (0.17 gramme);

M. Sig. : Every three or four hours until pain and fever have disappeared;

and also capsules of eucalyptus containing 5 minims (0.33 gramme) each, to be taken three or four times a day, and never on an empty stomach.

From a study of the literature of the subject and from personal experience in the use of the remedy, Thomas W. Ayers⁶⁴⁷ draws the following conclusions: (1) it is an excellent antipyretic; (2) as an antipyretic, it is best given in doses of from 7 to 10 grains (0.47 to 0.67 gramme); (3) it is an efficacious analgesic;

(4) as an analgesic, it is best administered in single dose of from 15 to 20 grains (1 to 1.30 grammes), instead of smaller doses given every few hours; (5) it is valuable for its sedative action upon the nervous system; (6) it is absolutely tasteless, and more pleasant to take than any other antipyretic; (7) the great advantage which it has over antipyrin and antifebrin is that it is non-toxic. Alex. S. Faulkner, of the Bombay Army,²⁰⁸ has published some notes with regard to the use of phenacetin in the treatment of continuous and malarious fevers. His results have been satisfactory. With a report of 6 cases he publishes excellent charts, in which the results obtained are elaborately detailed. Two of the cases were malarial; 2, simple continued fever; 1, rheumatism with painful joints; and the other an acute double pneumonia. In all of them phenacetin, in 8-grain (0.53 gramme) doses, reduced the temperature markedly and effected rapid recoveries. No untoward after-symptoms were observed. He considers phenacetin, from the results of these and other cases not published, a valuable remedy in the management of continuous and malarial fevers, and of other neuralgic and nervous affections dependent upon paludal poisoning especially, particularly in those cases of fever so commonly met with in India and other tropical climates.

George H. Pierce¹⁸⁸ has successfully employed phenacetin in cases of neuralgia from various causes. He found the drug especially valuable in relieving the pains of neuralgia, and also not only as an antipyretic, but as an analgesic. In malarial fever the remedy reduced the fever, but did not seem to affect the disease itself. The best results were obtained by the writer in cases of typhoid fever, either in single 8-grain (0.58 gramme) doses or in divided doses of 2 grains (0.13 gramme) each, every three or even two hours, until the temperature could be kept below 103° F. (39.46° C.). In 2 cases, one of an adult and the other of a child 4 years old, the temperature was kept near 100° F. (37.77° C.), and in both instances the other symptoms were greatly ameliorated. In these cases salol was also employed. In another case of typhoid fever no drug could relieve the intense headache except phenacetin, in doses of 2 grains (0.13 gramme) every two hours. The drug gave equally good results in 2 other cases of typhoid fever, especially in one of a child 4 years old, where $\frac{1}{3}$ grain (0.02 gramme) of phenacetin, given every three hours, was suf-

ficient to subdue the temperature, and in two weeks the child was free from fever. In still another case, one of tonsillitis with high fever in a child 5 years old, phenacetin, in 2-grain (0.13 gramme) doses, reduced the temperature without producing any untoward effects. A case of scarlet fever in a child is also spoken of by the author as having yielded to the influence of the drug.

Phenylhydrazin.—A. Heinz⁴ has been trying the antipyretic value of several of the derivatives of phenylhydrazin, but finds that they are so poisonous that they are practically of no use in practical medicine.

Phenylurethan.—This new antipyretic, which, under the name of phenylurethan, was first introduced by Giacomini,⁵⁰⁵ in the Turin Academy of Medicine, is obtained by the action of chloride of ethyl on aniline. It is a crystalline body, soluble freely in alcohol, but insoluble in water. The author found this drug to possess analgesic and antipyretic properties. It was used in 70 different cases: 3 of articular rheumatism, 3 of acute tuberculosis, 3 of typhoid fever, 10 of pneumonia, and the rest of various acute affections. Seven and a half grains ($\frac{1}{2}$ gramme) of the drug reduced the temperature from 2 to 5 degrees in from twenty to forty minutes after administration. The reduction lasted from four to eight hours. No untoward effects were observed. The drug reduces the pain and swelling of acute and chronic rheumatism; but as an analgesic the effects were not constant, as in some cases it produced favorable results, while in others it failed entirely. It is best administered in sugared sherry wine, and is said to prevent cyanosis, collapse, and other unpleasant symptoms.

Phytolacca Decandra.—Two cases of poisoning by this drug are reported by A. C. Ragsdale,⁷⁸⁶ the subjects being two children, 6 and 8 years of age, respectively. When first seen both appeared in great distress, and presented the following symptoms: incessant vomiting, and almost of pure blood; temperature, 95° F. (35° C.); body and face covered with cold sweat; pulse very weak, 55 per minute; intense thirst; pupils dilated; sensation of being "burnt up." The children, between the paroxysms, appeared drowsy and hard to arouse. There were also sense of constriction and soreness, dryness of mouth and throat, and constipation. The treatment consisted in mucilaginous drinks, stimulants, especially digitalis, to keep up the heart's action; and for the constipation a

brisk cathartic was administered. Recovery took place by next day, and the patients only complained of soreness in the region of the stomach and a dull headache.

Picric Acid.—According to Cavelli,⁵⁵ in the treatment of skin diseases characterized by inflammation, picric acid is an efficacious remedy. He claims to have obtained the best results, as an external application, in the treatment of erysipelas. The remedy has also proved of value in a case of lymphangitis, as a complication of caries and necrosis. A large number of cases of erythema and eczema were also treated by the author, with similar good results. Cavelli believes that the drug, to reduce the inflammatory processes, penetrates the corneal cells of the skin, and, owing to its astringent properties, it acts as a protective to the Malpighian layer of cells, and that it likewise probably acts as a parasiticide when entering the lymphatic vessels. The solution employed was $1\frac{1}{2}$ parts of picric acid in 250 of distilled water, to be applied externally from five to ten times a day.

Picrotoxin.—According to Bokai,⁸¹⁹ who has made a series of experiments, picrotoxin is a most rational antidote to morphine poisoning. The new drug is supposed to be, from its action upon the respiratory centre, physiologically antagonistic to the opium alkaloid. Picrotoxin, besides, increases the blood-pressure by a vaso-constricting action exercised upon the centres of the medulla oblongata. The two drugs are also antagonistic with regard to their action upon the cerebrum. From studies of the author, the utility of the drug in chloroform asphyxia is suggested.

Pilocarpine.—In certain cases of extreme dryness of the mouth, apparently from whatever cause, J. G. Blackmann² has found pilocarpine to produce excellent results, and especially where other remedies have failed. He has employed the drug in doses of from $\frac{1}{50}$ to $\frac{1}{10}$ grain (0.003 to 0.006 gramme) in the form of a gelatin lamel. After moistening the mouth with a little water, the lamel is placed on the tongue and allowed to dissolve. A flow of saliva follows in the course of twenty-four hours, without excessive perspiration, and the patients often speak of the taste of the mouth as simply delightful. J. W. Mitchell¹⁸⁶ reports 2 interesting cases to illustrate the importance of jaborandi as a nervous sedative. The first case was that of a woman subject to violent attacks of hysteria, where all previous treatment had failed. A teaspoonful

of the fluid extract every hour until the period of the return of the fit was given, with the result that the disease was entirely controlled, the nerves, under the influence of the remedy, "being too actively employed in keeping the throat clear." The second case was that of a woman 46 years of age, of nervous temperament, and who, as a sequel of an inflammation of the ear, due to exposure, began to be mentally affected, and suffered so excruciating pains as to cause furious conditions. No previous treatment was of any avail. The patient was placed under full-hour doses of jaborandi, and in four hours from the beginning of the treatment she began to discharge an abundant fetid secretion. The pain began to disappear two hours later, and in ten hours from the first dose it had entirely gone. The only symptoms produced by the drug were a numb feeling on left side of the head and dullness of brain, which lasted for about a week. The patient, after this period, was considered well, and allowed to go about. The same author has employed the remedy, with success, in cases of erysipelas and pneumonia.

Pulsatilla.—Charles Bovet,²⁵ has found the alcoholic extract of the drug the most active preparation, especially when freshly made. The active principle, anemonine, which is a glucoside, is less active than the extract. The author has employed the remedy in cases of dysmenorrhœa and ovaralgia. In the first instances he gives 4 tablespoonfuls of a wine containing about 10 drops of the extract of pulsatilla to the tablespoonful, four days before the expected period. The drug is suspended during menstruation for three or four days; then resumed for three or four days in the same doses as at the beginning. Simple cases of dysmenorrhœa have recovered under this treatment after two months. If the case is accompanied with chlorosis, Bovet uses chloride of manganese in the doses of $\frac{1}{8}$ grain (0.05 gramme) to the tablespoonful of the wine of pulsatilla. In cases of ovaralgia, especially when caused by chronic infarct of uterus or by inflammation of neighboring parts, the wine of the drug is given in continued doses till the complete disappearance of the pain. The writer has never observed complications under this treatment. The glucoside, which was administered in from $\frac{1}{8}$ grain to $1\frac{1}{2}$ grains (0.05 to 0.10 gramme) per day, proved to be less efficacious. D. H. Tucker, in a paper read before the Dallas (Texas) County Medical Society, reports¹³⁹

5 cases of orchitis, occurring in persons of from 2 to 26 years of age, which were treated under pulsatilla, asserting that they were all aborted by the drug. The cases were controlled in from twenty-four to twenty-six hours. The preparation used was the tincture, in doses of from 2 to 3 drops every two or four hours.

Pyoctanin.—This new antiseptic, which derives its name from two words meaning to destroy pus,⁸⁰ was first introduced as a therapeutic agent by Stilling, of Strasburg. According to this author, pyoctanin is inodorous, free from noxious properties, and as a destroyer of minute organisms is far superior to corrosive sublimate. It produces a stain, which, however, can be easily washed off by alcohol and soap. Since first employed in practice the remedy has been used in a variety of surgical affections. There are in the market two forms of pyoctanin,—the yellow and the blue. The substance is soluble in water and alcohol. The blue form makes a beautiful blue solution. It can be employed in 0.05-per-cent. watery solution or in a 2-per-cent. powder. W. W. Van Arsdale¹ has used the drug with apparent success in cases of superficial wounds, excoriations, ulcers, abrasions, burns, and all kinds of granulating surfaces. The preparation most used was the violet pyoctanin of Merck in aqueous solution, 1 part by weight in 1000. Absorbent gauze, saturated with this solution, was simply applied to surfaces, the dressing covered with a protective,—a measure that was found to be the most satisfactory. This mode of application was much favored by patients. Ulcers did remarkably well under the use of the remedy, and never were there observed any exuberant granulations, eczema, or symptoms of irritation or increased serous secretion from the wound. The drug exercised an astringent action on granulations, and actually hastened the healing of the ulcers. Burns, under the same dressings, showed very good results also. Pyoctanin has no influence on necrotic tissues, so that the cleansing of necrotic ulcers and the coming away of sloughs are retarded, as in the case of other antiseptics. Wounds treated by the remedy heal by primary intention. The drug produced good results in venereal ulcers, especially under the application of dry gauze, but a less-marked influence is exercised on the ulcers of tertiary syphilis; on these latter iodoform appeared to act much better. The author believes that while pyoctanin appears to destroy certain kinds of pus, when

coming in contact with it, the remedy has not the power to penetrate sloughs, and in these cases frequent dressings are necessary; and, again, while it keeps the patient free from pain in cases of superficially affected parts, the drug does not act in deep-seated pain. The case is cited of a man suffering from a traumatic wound, and, notwithstanding the use of pyoctanin, under which the lesion progressed favorably, the patient continued to suffer severe pain at the seat of injury. Adolph Kessler⁵⁰, has had results so marvelously brilliant that he is inclined to look upon pyoctanin as the *ideal* antiseptic and pus-destroyer. The drug has acted wonderfully in his hands in suppurative wounds and old indolent ulcers, where marked improvement could be noticed after a few applications. Chronic discharges have disappeared almost at once, in which cases the microscope failed to reveal the presence of pus-cells. Two typical cases treated with pyoctanin are reported: one of syphilitic ulcerations of the frontal and temporal bones, extending to the scalp, in a young man, and the other a woman suffering from gangrenous dermatitis involving the right foot and leg and part of the left foot. In the first case a single application of the remedy sufficed to produce total stoppage of suppuration and a marked diminution in the tenderness and pain which had previously been present. In a short time the patient showed unmistakable signs of a rapid and sure recovery. The second case, which presented a worse aspect in every way, was somewhat relieved by the use of aristol and bituminated iodoform as regards pain, but the suppuration continued uninterruptedly. A single application of pyoctanin in substance was followed by almost miraculous results. The suppuration completely disappeared within twenty-four hours, as well as the offensive odor, and the ulcerating, sloughing tissues, which for nearly eighteen months had presented a terrible condition, were immediately changed into a dry, clean, and healthy-looking surface, upon which granulations began to appear. The case, under continued treatment by means of the solid substance or a strong solution, gave, in a short time, evidence of complete recovery. Stilling and Wortmann⁴¹ tested its action on putrefactive bacteria, and found that the drug killed the micro-organisms in a concentrated solution of 1 in 4000. Jaenicke and Braunschweig⁵⁴, have confirmed these observations. Jaenicke especially has tried the drug

on pure cultures of several pyogenic micro-organisms. In bouillon the staphylococcus pyogenes aureus was destroyed by a solution of 1 in 2,000,000 parts, the streptococcus by 1 in 250,000 parts, a diplococcus resembling the coccus of pneumonia by 1 in 1,000,000 parts. This action was less pronounced in blood-serum, and in this the staphylococcus was killed only by 1 in 500,000 parts. The staphylococcus aureus was destroyed in one minute by a solution representing 1 in 1000, and the streptococcus in five minutes, the anthrax bacilli, without spores, in two and a half minutes, while in a period of fifty hours the solution had no effect on the bacilli of typhoid fever. The same solution killed, in five minutes, the staphylococcus in a dried condition, and when suspended in serum of blood an hour was necessary to destroy it. It is therefore held by Jaenicke that pyoctanin may be considered as an inhibitory agent to sepsis, but not as a disinfectant.

Pyrodin.—Pescarolo⁵⁰⁵ gave to a healthy individual, of robust constitution and totally without fever, a dose of 0.20 grammme (3 grains) of pyrodin, and the effects produced were insomnia, general debility, pallor, cyanosis, and albuminuria. These phenomena appeared in from twenty-four to thirty hours after the administration of the drug. In a febrile case, doses of from 0.05 to 0.20 grammme ($\frac{1}{4}$ to 3 grains) produced a reduction of temperature of from 1° to 2° C. (1.8° to 3.6° F.). The apyrexia caused by pyrodin tended to be of a longer duration than that produced by other antipyretics. However, in febrile subjects the drug reduces the temperature to a slight degree. The continuous ingestion of the drug, during two or three days, even in small doses (0.10 grammme— $1\frac{1}{2}$ grains—on an adult), brought on serious changes in the circulation, cyanosis, pallor, small and frequent pulse, difficult respiration, dyspnœa, and enlargement of the liver and spleen.

Quebracho.—This plant, which is the *Aspidosperma quebracho* of the Apocynaceæ, belongs to South America, where it is largely used as a febrifuge. It contains many active principles, among which may be mentioned the pure aspidospermine, quebrachine, hypoquebrachine, quebrachamine, aspidospermatine, and aspidosanine. Quebrachol is the name of another substance asserted to exist in the plant. The antithermic properties of quebracho have been pointed out by Huchard,²⁴ and some authors have found it of value in dyspnœa, and especially in functional pulmonary

affections. The antithermic properties of the drug reside particularly in quebrachine. The plant produces hypersecretion of the kidneys and of the intestinal and salivary glands. It appears that dyspnœa is only relieved by the pure aspidospermine. All the alkaloids are poisonous and in sufficiently large doses produce convulsions and paralysis by acting upon the motor system; but the pure aspidospermine is the least toxic of the active principles. The bark of the plant is administered in powder in doses of from 30 to 50 centigrammes ($4\frac{1}{2}$ to $7\frac{1}{2}$ grains) a day, the tincture in from 2 to 4 grammes ($\frac{1}{2}$ to 1 drachm), and the fluid extract in the same doses as the powder.

Quinine.—R. B. McCall⁹ has obtained the best results in the treatment of rheumatism and neuralgia from salicylate of cinchonidine. Six cases are reported in which the drug produced most satisfactory effects, and he affirms that it possesses great therapeutic value, especially in those cases characterized by the presence of lumbar pain and immobility. The drug was usually given in 5-grain (0.33 gramme) doses three times a day, in the form of tablets or capsules, the total quantity of the remedy given in a single day never exceeding 20 grains (1.67 grammes). No untoward after-effects were observed; on the contrary, the medicine appeared to improve the appetite and promote the sleep. The author suggests the use of the drug not only in the treatment of the simple forms of neuralgia and rheumatism, but also in the various neurasthenic types of these maladies. It is stated that the solubility of the hydrochlorate and valerianate of quinine is much increased by the addition of antipyrin.²²

Resorcin.—This drug is recommended by Chas. Szadek (corresponding editor, Kieff, Russia) in the treatment of certain skin diseases, especially condyloma and verruca, in the form of the powder or ointment. The author reports the cure of rodent ulcer by the use of a mixture of vaseline and resorcin, in the proportion of 25 per cent. Andeer²³ has found that, while impure resorcin produces vomiting, the chemically pure drug is one of the surest means of allaying the different forms of vomiting. It can be given either in powder or solution in daily dosage of 0.5 to 3 grammes ($7\frac{1}{2}$ to 45 grains).

Rhus Aromaticæ.—W. M. Powell²⁴ reports the cure of 16 cases of enuresis by means of the use of rhus aromaticæ. Great

attention was also paid to diet and hygienic precautions. The cases had previously been unsuccessfully treated by other means. The treatment continued over the space of one month. His formula for young children was as follows:—

R Ext. rhus aromat. fl., fʒiiij (12 grammes).
Elix. aromat., fʒiss (47 grammes).
Aq. cinnam., . . . q. s. ad fʒiiij (96 grammes).
M. Sig. : fʒss (2 grammes), to be increased to fʒj (4 grammes) q. d., after-meals.

Saccharin.—In order to prevent any confusion which might occur from the similarity of saccharin and saccharum in writing prescriptions, the names glukusin and neo-saccharin have been suggested to replace that of saccharin.²³⁹

Safranine.—See Aniline.

Salol.—Solomon Solis-Cohen²⁴⁰ uses a compressed pill of 3 grains (0.20 gramme) each of salol and terpine hydrate in the treatment of colds. One or 2 pills are given every two, three, or four hours, according to the severity of the symptoms.

Sodium Bicarbonate.—E. J. Dennis,¹⁹⁹ having observed that the secretion from the pustules of a patient with rhus-toxicodendron poisoning was intensely acid, was led to try the bicarbonate of soda. Almost immediate relief ensued.

Sodium Creasotinate.—According to the experiments of Dounne,²⁵¹ of the three isomeric bodies known under the names of ortho-, meta-, and para- creasotinate of sodium, only the last one, which contains paracreasotonic acid is of use in practical medicine as an antipyretic. The first of these substances appears to be inactive, the second dangerous. The paracreasotinate of sodium was found to be well borne by adults in doses of from 6 to 8 grains (0.40 to 0.53 gramme), daily. In children it acted as a powerful antipyretic, and in one case, a child 12 years of age, 1 grain (0.07 gramme) given within three hours caused excellent effects. It has been found useful also in acute gastric catarrh of children. The drug appears as a fine, crystalline powder, soluble in 24 parts of warm water, and has a bitter taste. It melts at 151° C. (303.8° F.) and sublimes without decomposition. It is eliminated by the urine, to which is given a violet hue on the addition of perchloride of iron.

Sodium Dithiosalicylate.—This drug is asserted²⁴¹ to be more energetic than the simple salicylate, and is very well tolerated by the stomach. It has been used with success in cases of articular

rheumatism, in doses of 20 centigrammes (3 grains) twice a day, a quantity which can be increased according to the severity of the attack. Under the full action of the drug, as when 80 centigrammes ($12\frac{1}{2}$ grains) of the drug have been taken, the only disagreeable symptom experienced by patients has been buzzing in the ears.

Somnal.—Of the new hypnotics, somnal has of late attracted a good deal of attention. It is preferred, especially by Kny, of Strasburg,⁶¹ because it has very little influence on the heart. On account of its rapid action, it is superior and preferable to sulphonal. Its inventor, Radlauer, of Berlin, asserts that it is a distinct chemical compound, having the formula $C_7H_{12}Cl_3O_3N$. It is a clear liquid made from chloral, alcohol, and methan. The initial dose has been put down as 2 grammes ($\frac{1}{2}$ drachm). The somnolence that it produces lasts from seven to ten hours. Langenbuch, of the Lazarus Hospital of Berlin, has given as much as 4 grammes (1 drachm) of it without producing toxic effects, with excellent results. The sleep is not profound. Frank Woodbury¹⁹¹ states that the action of somnal resembles that of chloral in quickness and effect; that no marked depression is produced upon the pulse or the respiration, both being slowed as in natural repose. No untoward after-effects were observed, and the patients generally had an appetite for breakfast. There was no constipation, and the kidneys acted more freely than usual. He reports 1 case of acute alcoholism with neuralgia of the bowels where the drug gave satisfactory results. No bad after-effects were produced. The remedy failed in syphilitic headache and insomnia. It was found useful in cases of insomnia, fretfulness, and restlessness in young children, in whom better results were obtained than with opiates. Woodbury quotes Ernest Laplace as having used the drug upon 6 patients at the Philadelphia Hospital, with good results in 4 of them, in whom sleep came on in from five to eight hours after administration. Apparently no effects were produced on temperature. The dose for adults varied from 20 to 30 minims (1.30 to 2 grammes); that for children was not given.

Sulphonal.—Thirty-three cases have been observed by W. H. Flint, of New York,⁸⁵ under the influence of sulphonal. In all of them the drug, in doses of 20 or 30 grains (1.30 to 2 grammes), proved to be a safe and reliable hypnotic, producing a sleep of over six hours, this coming on about an hour after the administration

of the remedy. No objectionable effects were witnessed, with the exception of a moderate somnolence on the morning following the ingestion of the drug. It was not followed by any undesirable *sequelæ*, nor by derangement of the appetite or digestion. In none of the cases were observed nausea, vomiting, or constipation; neither were the circulation and respiration appreciably affected. The cutaneous and renal secretions remained unaffected. On the whole, success with the use of sulphonal was obtained in about 87 per cent. of the cases treated. The remedy was chiefly valuable in nervous insomnia, in some forms of insanity (especially in acute maniacal conditions), in acute sthenic febrile diseases, the opium habit, gastric irritability, neurasthenia, and in some cases of anaemia. It seemed to be contra-indicated in insomnia from pain, cardiac dyspepsia, gastrectasis, congested stomach, owing, in the first cases, to its narcotic action and in the others to its slow solubility. The drug likewise acted badly in acute melancholia, insanity after abortion or labor, and perhaps in sclerosis and in angina pectoris. Untoward effects were produced by doses of 30 grains (2 grammes) in adults, or in small doses frequently repeated. Some of these symptoms were fatigue, depression, tinnitus aurium, and nausea. In some cases, marked pallor and œdema of the eyelids. Still more toxic effects were diarrhoea, aphasia, and ptosis, a cutaneous eruption resembling rubcola or urticaria, brachycardia, inco-ordination, semi-coma, and collapse. Sulphonal, according to the author, should be administered by the mouth an hour or more before its desired effects. Its use by the rectum was not satisfactory. Children took it readily and seemed to tolerate it well.

Garnier,⁸⁰ refers to 2 cases, in which locomotion was disturbed under the use of sulphonal, but thinks it difficult to determine whether the results could be attributed to the action of drug upon cortical motor centres or to the vertigo produced by the remedy. He quotes Kast as having noticed loss of power in dogs, especially of the posterior limbs, after the administration of sulphonal,—a loss that might be likened to that produced by removal of the cerebral cortex. He further mentions Otto as referring to cases in which walking was rendered difficult or impossible under the use of 75 grains (5 grammes) of the drug. Five cases of temporary loss of power, under doses of 30 grains (2 grammes), have been observed by R. Percy Smith,⁸¹ the result being attributed by him to some

interference with the cortical functions, and not simply to giddiness produced by sulphonal. In 2 of the cases the patients themselves attributed the effects to the drug, and in 1 there was, besides staggering and loss of power, a complete mental confusion. In all the cases these untoward symptoms disappeared on suspension of the drug, and in some re-administration was followed by no bad effects. Henry Sutherland ⁶ finds sulphonal a valuable remedy in chronic insanity, with recurrent attacks of excitement, the remedy producing sleep shortly after its ingestion, and its good effects being often seen two or three nights after administration. In continued excitement, however, the drug appeared to be injurious by increasing the excitement on the day following the use of the drug. C. Knox Bond ⁶ advocates the use of this drug in the insomnia of typhus fever. He has employed it in 2 or 3 cases with satisfactory results.

Knoblauch ¹¹⁶ agrees with De Monthyel in that sulphonal is not a remedy, but a poison; that it is not a reliable hypnotic; that the doses sufficient to produce sleep vary in different individuals and even in the same individual at various times, and that in many cases symptoms of poisoning are produced by even small doses. In a report of the Therapeutic Committee ² are given the results obtained from the use of sulphonal in 32 cases. In 11 instances 20 grains (1.33 grammes) were given once at night. Sleep came on in from half an hour to three hours, in 1 case in five hours, and in another in nine hours. A second dose, on the following night, produced sleep in 1 case in five minutes. In 4 cases sleep lasted all night, in 4 others six hours, and one to two hours in 3 cases. In 4 cases, 25 grains (1.67 grammes) caused sleep in two hours, and this lasted six hours or all night. Ten to 15 grains (0.67 to 1 gramme) produced less sleep, and in a case of pneumonia the amount failed to cause any sleep. In 7 cases, 30, 40, and even 60 grains (2.00, 2.67, 4.00 grammes) were employed, but the effects did not differ from those produced by 20-grain (1.33 grammes) doses. Thirty grains (2 grammes) failed to act in a case of chronic gout. Of the disagreeable effects produced in 6 out of 10 cases, under 20-grain (1.33 grammes) doses, giddiness was observed four times, drowsiness six times on the following day, and headache and inco-ordination of gait each twice. Ten grains (0.67 gramme) produced drowsiness in 1 case

out of 4; in 5 cases, with 15 grains (1 gramme), drowsiness and giddiness were noticed twice each. In 4 cases, under 20 grains (1.33 grammes), drowsiness was noticed twice, giddiness and headache once each. Under 30 to 60 (2 to 4 grammes), administered to the 7 cases referred to, drowsiness was observed four times, giddiness and headache twice each, and inco-ordination and vomiting once each. In regard to the lasting effects of the remedy, it was found that in several cases a second dose has a greater effect than on the first night; thus, in one instance, 20 grains (1.33 grammes) produced a sleep of two hours, with no after-effects. The same amount on the following night, in the same patient, caused an eight hours' sleep, with drowsiness, giddiness, and incoordination of gait on the next day. Prolonged use diminishes, however, the effect of the drug. Thus, in a case of asthma and bronchitis a dose of 20 grains (1.33 grammes) was given every other night for two months. In the first fifteen days sleep came on in an hour and lasted twelve hours each night; the remedy was suspended for a week and the insomnia returned. During the remainder of five weeks the sulphonal was given again; it then produced sleep after three hours, this lasting six hours. In a case of phthisis, the drug was administered in 20-grain (1.33 grammes) doses; it was reduced to 10 grains (0.67 gramme) after five days, and afterward again increased. The drug was suspended for a fortnight, and on the administration being resumed it produced no sleep, but only drowsiness. However, in a case of neurasthenia, quoted by Priestley, the drug, in 10 to 20 grains (0.67 to 1.33 grammes) doses, did not lose its effect for six months.

J. M. Coates²³⁹ finds sulphonal of the greatest benefit in epilepsy and hiccough. Sulphonal has given satisfactory results as a hypnotic in the hands of Alex. S. Faulkner, of India,²⁰⁸ in cases of neuralgia, insomnia, inertia, and others, so commonly met with in the tropics. Even in other cases the drug has produced beneficial results with no untoward after-effects. He reports the case of a man with fracture of left arm, wounded scalp, and general contusions about the head and face, in which the remedy was administered in 15-grain (1 gramme) doses at bed-time for some time, and always caused the patient to sleep with comfort. In another case of insomnia it produced a good night's rest, with no evil effects, although the dose was a large one. He further reports a

third case of gonorrhœa with chordee. One night, at bed-time, the patient was given 20 grains (1.33 grammes) of sulphonal, and next morning he stated that he had slept well, but got up twice during the night to micturate, and had no erection during the night, but complained of feeling drowsy and awakening. The next night he had a second dose with a like result, and subsequently no further treatment was required so far as the painful erection was concerned.

Thallin.—Moncorvo,²⁰ finds that thallin, when applied directly to a bleeding surface, has marked haemostatic properties. This effect, while appearing to be due to a capillary action on the blood-vessels and a coagulation of the blood, should be confirmed by further experiments.

Thiol.—Thiol is a mixture of sulphated hydrocarbons, having a faintly bituminous odor, a bitter, astringent, though not disagreeable taste. Two forms are seen in the market: the liquid, which is a watery solution of 45 per cent., and the dry, which is a fine powder, of brownish color, soluble in water. Lange,⁵⁵ contrary to the results of Bouzzi, who asserts that the drug is as efficacious as ichthyol in various dermatoses, believes that it is inferior, and that there are no sufficient reasons to substitute it for ichthyol in skin diseases.

Ural.—From an exhaustive study of this new hypnotic, Schmitt,¹⁸⁴ has arrived at the following conclusions: 1. Ural, like chloral, is a soporific. 2. According to the dose employed, a profound sleep is produced, accompanied with anaesthesia, abolition of reflexes, slowing of the respiration and pulse, depression of temperature, and lowering of the arterial pressure. 3. Toxic doses produce death by respiratory failure, the heart being arrested in diastole. 4. Like chloral, ural acts successively on the cerebrum, the medulla, and the spinal cord. 5. These results have been obtained from hypodermatic injections of the drug, as when given by the stomach the effects of ural are marked by those of the necessary quantity of alcohol employed to dissolve it, and when administered by itself its soporific action is negative. 6. Ural has no advantage over chloral; on the contrary, it has the inconvenience of being insoluble. These experimental results, obtained in the lower animals, have been later confirmed by clinical observations. According to Poppi,⁵⁰⁵ it acts upon man as upon the lower

animals. Its action is prompt and decided. The sleep produced by it comes on in from half to one hour, and is not profound, but it has the advantage of not causing vertigo or intellectual depression. It is cheap, which is another advantage.

Urethan.—Urethan has been tried by W. H. Flint⁸⁰, in 42 cases of insomnia, and found to possess slight hypnotic properties, much inferior, indeed, to those of other drugs, such as sulphonal, amylene hydrate, and paraldehyde. According to Schmedeberg, large doses produced loss of mobility, sensibility, and consciousness, increase in the depth and frequency of respirations, and little or no effect upon the pulse and blood-pressure. Motion was lost before sensation, and the temperature fell. The reflexes were little affected during sleep produced by the drug, but diuresis and diaphoresis sometimes occurred. Urethan was best applied in cases of insomnia produced by cardiac troubles without great dyspnoea, and that dependent upon moderate mental excitement. It rendered good service in the insomnia of melancholia, where sulphonal, amylene hydrate, and paraldehyde were too powerful; but the drug was not indicated in insomnia from pain or cough, owing to its lack of anodyne properties. One hundred and eighty grains (12 grammes) produced toxic effects, nausea, somnolence, and gastric disturbances. Urethan is soluble in water, 2 parts to 1, and was thus best given by the mouth or rectum. The dose for adults varied from 15 to 30 grains (1 to 2 grammes); children, 12 to 18 grains (0.80 to 1.20 grammes); from 2 to 3 years old, 8 grains (0.53 gramme); and from 4 to 14 years, 15 to 20 grains (1 to 1.33 grammes). Four grains (0.25 gramme) was the average dose for subcutaneous injection.

Vegetarianism.—It has been held recently by Dujardin-Beaumetz², that ptomaines and leucomaines play an important part in the auto-intoxication of many diseases, especially congestion of the liver and gastro-intestinal disorders. In such cases the author believes a vegetable diet will produce better results than animal food. Eggs, milk, vegetables, and fruit would constitute a sufficiently nourishing diet for the cases referred to. A vegetable diet would again be preferable in cases of kidney troubles arising from interstitial and catarrhal nephritis, in dilatation of the stomach, in putrid diarrhoea, in acute gastritis, and in dyspepsia due to a modification of the gastric juice.

Veratrum.—A. J. Howe¹⁰² considers local applications of veratrum not enough used. According to this writer, the pain and itching of chilblains can be relieved and even cured by the use of a dilute tincture.

EXPERIMENTAL THERAPEUTICS.

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Alcohol.—Blumenau ^{586, 90} describes a series of physiological experiments as to the action of alcohol on the functions of the stomach in 5 healthy young men, aged from 22 to 24, in Koshlakoff's clinic, in St. Petersburg. Alcohol was given, ten or twenty minutes before dinner, in the dose of 100 cubic centimetres ($3\frac{1}{2}$ ounces), and in the form of 25- or 50-per-cent. solutions. The dinners invariably consisted of from 500 to 600 grammes (16 ounces) of soup, a cutlet (weighing 90 to 100 grammes— $2\frac{1}{2}$ to 3 ounces), and 200 or 250 grammes (6 to 8 ounces) of wheat bread. The outcome of Blumenau's researches (which confirm and supplement Mohilansky's investigations on the same important subject) may be condensed thus: 1. During the first three hours after the ingestion, the gastric digestion is distinctly retarded, which is caused by a marked diminution of the digestive power of the gastric juice. (See ANNUAL for last year.) The diminution is dependent upon the decreased proportion of hydrochloric acid and general acidity of the juice; the acidity is almost entirely produced by lactic acid. 2. In habitual abstainers the changes are more pronounced than in alcohol drinkers. 3. All other conditions being equal, stronger solutions of alcohol give rise to more intense changes than weaker ones. 4. Subsequently, during the fourth, fifth, and sixth hours after the meal, the gastric digestion becomes considerably more energetic. The general acidity of the juice rises (from 0.22 to 0.35 per cent.). The proportion of HCl gradually increases, to reach its maximum (from 0.12 to 0.14 per cent.) by the end of five hours after the meal, while that of lactic acid gradually sinks, to attain its minimum about the same time (when the acid either altogether ceases to give any reaction, or gives but a very faint one). 5. Corresponding to the alterations, the gastric juice during the second stage acquires a far higher

digestive power. 6. Under the influence of alcohol, the secretion of the juice becomes more profuse and lasts longer than without alcohol. 7. During the first hour the action of pepsin seems to be slightly decreased, because, on adding rennet to cows' milk, it coagulates more slowly than in subsequent hours. 8. The motor power of the stomach, as tested by salol, given internally (Ewald's method), somewhat decreases. (The first salicyluric-acid reaction in the urine makes its appearance from fifty to seventy minutes after the ingestion of the substance.) 9. The same may be said in regard to the absorptive power of the stomach, determined by the internal administration of iodide of potassium. 10. The intensity of the alteration in the motor and absorbing powers of the organ corresponds to the concentration of alcoholic solutions ingested.

D. I. Diakonoff, ⁹⁰ of St. Petersburg, has undertaken a course of experiments on febrile patients with the object of elucidating the effects of alcohol on the assimilation and metabolism of proteids, as well as on the kidney, skin, appetite, etc. Of the 7 patients experimented upon, 6 were suffering from enteric fever and 1 from exudative pleurisy; 2 were total abstainers and 5 occasional alcohol consumers. Alcohol was administered internally, in the shape of a 40-per-cent. *vodka* (aquavit), four times a day, the daily dose being invariably 50 cubic centimetres ($1\frac{3}{5}$ ounces) of absolute alcohol. The patients' diet was limited to milk and white bread. The general treatment of the cases was purely expectant (*i.e.*, no remedies, baths, etc., were employed). Diakonoff found that:

1. In febrile patients, alcohol (in these doses) invariably lowers the assimilation of nitrogenous ingredients of food.
2. No difference between habituated and non-habituated persons can be observed in regard to this effect of alcohol.
3. Alcohol spoils appetite and increases both the total daily amount of faeces and the proportion of water and coagulated albumen therein.
4. It decreases the quantity of albumen undergoing decomposition in the system.
5. In such cases, where the assimilation of nitrogen sinks but slightly, alcohol lowers the nitrogenous metabolism; where, however, the depression of the assimilation is considerable, the metamorphosis proves to be augmented.
6. Alcohol disturbs the metabolism also in qualitatively, since it raises the proportion of under-oxidized products.
7. It considerably increases the daily amount

of the urine. This statement is diametrically opposed to that of Mohilansky. (See last year's ANNUAL.) The latter observer, however, experimented upon healthy people. 8. It markedly depresses the aqueous losses through the skin and lungs. 9. The decrease in the assimilation and the increase in the renal secretion remain more or less marked even for some time after discontinuing the administration of alcohol. 10. The patient's subjective state seems to be improved by alcohol.

Eagleton¹¹² finds that the continuous injection of alcohol into the circulation produces the following results: 1. Dilute alcohol in small doses, frequently repeated, increases cardiac force and arterial pressure. Large doses at first increase, then decrease, arterial pressure, followed by a partial rise to normal, and, finally, a progressive fall of pressure until death; at the same time, the frequency of the heart's beat is at first decreased, though there is sometimes a primary increase; it then partly returns to normal, and is subsequently again decreased. 2. Strong alcohol in small doses generally increases pulse-rate and cardiac force. 3. Toxic doses decrease at once the rate and force of the cardiac beat, and diminish greatly arterial pressure. 4. These different phenomena are due to a direct action of the alcohol upon the heart. 5. The results obtained by different experimenters vary, chiefly because of the difference in the strength of the alcohol used, the manner of administering the drug, and in the kind of animals used. 6. The clinical belief that small doses of alcohol increase the force of the circulation, by directly acting upon the heart, is sustained. 7. Alcohol in small doses is a cardiac stimulant; in large doses, a cardiac depressant. 8. The depressing action of the drug upon the circulation is an important factor in acute alcoholic poisoning.

The changes produced by alcohol in the organs of digestion, such as the stomach and liver, are well known, and it is also a recognized fact that very grave nervous disturbances arise from the excessive indulgence of this taste.

Jackimoff,⁷⁴ of Mierzelewski's laboratory, in order to study the nervous changes following alcohol, has given the drug to dogs and puppies in the strength of 40 per cent., dividing his research into three series. In the first series the drug was given by the stomach in gradually-increasing doses of from 1 to 8 cubic centimetres (16 grains to 2 drachms) for each kilogramme of weight

until the animal died. In the second series, after the method named had been carried on for a month, so acute an intoxication was produced as to result in death; and in the third series acute drunkenness was caused.

The results of the first series are as follow: A gradual onset of paresis of the hind-limbs, preceded by muscular relaxation and languor, with tenderness of the nerve-trunks and general hyperæsthesia. Death ensues in from five to eight months. Post-mortem examination reveals no changes in any of the organs, and under the microscope the peripheral nerves, intervertebral ganglia, and anterior and posterior nerve-roots show nothing abnormal. The brain is congested and infiltrated, and the cells in the gray matter in the spinal cord, particularly in the anterior cornua, show intense disintegration, exhibiting many vacuoles, granulations, and indistinct nuclei. These changes are also to be found in the pons and medulla oblongata, but to a less-marked degree. The white matter of the brain and cord remain intact.

That some error must exist in regard to the examination of the peripheral nerve-fibres seems certain from what Jackimoff himself asserts, for it is most unlikely that the trophic cells of the anterior cornua of the cord could undergo such marked pathological changes without causing atrophy of these tributary filaments. When the animals received the alcohol according to the second method named, the same changes to a less degree were observed.

If the constant acute intoxication of the third stage be persisted in, death occurs in from thirty to thirty-two days, and the autopsy discloses congestion of the brain, spinal cord, and the membranes of the same. Microscopic examination shows great hyperæmia of the gray matter of both the brain and cord, which extends into the adjacent white matter. In all instances the degeneration is an ascending one, which nevertheless decreases in severity as it proceeds, the chief lesion being found in the lumbar enlargement of the spinal cord.

The various studies on alcohol which have been made for many years by investigators in every civilized country have not yet set at rest the incorrect and correct beliefs which have existed in regard to its physiological effects, and any researches which tend to decide these unsolved problems are of interest. This is particularly true of the experiments recently published by Reichert⁸⁰ and

carried out by him by the aid of an accurate calorimeter. His paper is well worth reading, but we can only give his conclusions, which show that alcohol does not affect the total quantity of heat produced; that more heat is dissipated than produced; that the fall of temperature is due to the excess of dissipation, and is in direct proportion to that dissipation; and that, in all likelihood, alcohol, by undergoing oxidation, yields energy in the form of heat, thus conserving the tissues and acting as a food.

Alkalies on Tissue Change.—Stadelmann^{116, 90} has undertaken to investigate whether large doses of the alkalies, as the author gives them, especially in diabetes, does not in some way unfavorably influence tissue change. The experiments were made upon his pupils, who were in a state of nitrogenous equilibrium, and alkalies were given in large doses, extending over long periods. The substances exhibited were carbonate, bicarbonate, and citrate of sodium. The salts of vegetable acids were much more readily absorbed than the carbonates, and were excreted partly as carbonates; while the carbonates were at once acted upon by the gastric juice taking up the hydrochloric acid, thus acting both on tissue-change and digestion. The nitrogenous constituents of urine, ammonia, and uric acid were diminished after alkalies. As regards the amount of urea excreted, the cases varied, oscillating between excess over normal, and the reverse; but, taking the average over a long period, the quantity passed was very nearly normal. The amount of nitrogen in the faeces increased with the diminished consistency of the stools, and occasionally reached double the normal. There was always more or less diuretic effect after the alkalies, and increased oxidation of body-fat seemed also to take place. Phosphoric and sulphuric acids in the urine were diminished,—a point of some importance, showing that although by giving acids we may withdraw alkalies from the body, yet by giving alkalies we cannot increase the excretion of mineral acids. It was also found, after giving large quantities of citrate of sodium, that more sodium (after deduction of the normal amount) was found in the urine than had been administered. The difference between the absorption of citrates and of carbonates seems to show that citrates are converted into carbonates in the blood, and not in the intestine, as Buchheim supposes. Even in doses of 43 grammes (about 1½ ounces), and after a total quantity of about 600 grammes

(19½ ounces), citrates caused no dyspepsia, nor any difference in the general health. Further researches were undertaken to determine the effect of alkalies on biliary secretion. A large number of salts were used, and in small doses were found to have no influence; in large doses the secretion was diminished. Thus, the beneficial effect of such waters as Carlsbad in liver disease must not be ascribed to a cholagogue action, but simply to lessened secretion. Spilker²⁶²,₂₆₃ has endeavored to discover whether the alkalies and alkaline mineral-waters do not diminish ordinary secretion. He found that in man alkalies diminished the formation of uric acid, while in the dog it was increased. In man, therefore, alkalies would seem to increase oxidation, while in dogs they retard it. Comparison of the studies of Stadelmann and Spilker shows that the results of the latter in the dog are probably correct in man as well, for Stadelmann also found oxidation decreased, or, in other words, a decrease in the uric acid excreted.

Antipyrin.—Experiments during the past year with this drug have been made by Simon and Hoch,⁷⁶⁴₁₈ who have reached results which, while entirely confirmatory of those obtained by earlier investigators, possess interest because of their thoroughness and reliability. They agree with Batten and Bokenham (see last year's ANNUAL) in regard to the effect of the drug upon the spinal cord, and in its local and general action as a sedative to the sensory nerves. When poisonous doses were used, and convulsions produced in consequence, these disturbances of motility were the result of an action on the brain, as they did not occur after section of the spinal cord. In the experiments of the editor they appeared to arise from both the cord and brain. Simon and Hoch are also in accord with most observers in the statement that antipyrin does not affect the circulation to any extent in moderate doses.

Atropine.—Experiments made by Panow⁵⁸⁸₁₈ upon two persons suffering from gastric catarrh and two others who were in a state of health showed that this drug distinctly decreases the secretion of the gastric juice. When medicinal doses were used in healthy persons the decrease was very marked, while in those who had gastric catarrh no changes were noted.

Bromide of Gold.—The introduction of this remedy for the treatment of epilepsy has caused Shtcherbak⁵⁸⁸₁₈ to undertake a series of experiments upon the exposed cerebral cortex in its motor

areas, in order to determine whether the effects of this bromide salt would be identical with those salts studied by Albertoni and others. The gold salt was given by the femoral vein, by the mouth, or hypodermically.

The essential results may be condensed somewhat as follows:

1. Bromide of gold undoubtedly inhibits the cortical motor centres, even when administered in smaller doses than other bromides. After an internal administration of bromide of gold in the dose of 0.1 or 0.2 gramme ($1\frac{1}{2}$ or $3\frac{1}{10}$ grains) to the kilogramme of the animal's weight, even the strongest and very prolonged electric stimulation of the cortex fails to bring about any epileptic seizures. To obtain the same effects from bromide of potassium the latter should be introduced in the dose of 0.6 or 0.7 gramme ($9\frac{1}{2}$ or $10\frac{3}{4}$ grains) to each kilogramme, while bromide of sodium should be given in still larger quantities.
2. The most marked effects are observed when the drug is injected into a vein, when even 0.005 gramme ($\frac{2}{5}$ grain) to 1 kilogramme totally inhibits the fits.
3. Irritability of individual motor centres, as determined by the appearance of contractions in corresponding muscular groups, is depressed by bromide of gold in a but trifling degree.
4. Excitability of the white substance of the motor region remains intact.
5. The drug seems to affect mainly the tracts of communication between individual motor centres as well as between remote areas of the cerebral cortex.
6. It does not appear to possess any particular cumulative action.
7. Of accessory effects there are observed only vomiting (very rarely, and that solely on an internal use) and some depression of sensation which occurs only on the use of larger doses, such as 0.15 gramme ($2\frac{1}{3}$ grains) to each kilogramme. (Even a prolonged administration never gives rise to unsteady gait, general depression or languor, or emaciation, all of which symptoms are observed in the case of bromide of potassium.)
8. The physiological effects of bromide of gold and their difference from those of the other bromides, cannot possibly be attributed to the proportion of bromide present therein, since the strongest of the three, bromide of gold, contains the smallest amount of bromide (55 per cent. by weight), while the weakest of them, bromide of sodium, shows the richest proportion of the element (77.7 per cent.), the potassic salt standing midway with 67.2 per cent. of bromine.

Caffeine.—Quite a number of studies of the action of caffeine have been made during 1890, chief of which may be mentioned that of Reichert,⁸⁰ who has carefully worked out its effects on the circulation, tissue metamorphosis, and animal heat. In May this experimenter published his results in connection with the circulation. He points out that the previous studies on record need confirmation, and shows that the caffeine of the drug-stores is really theine, since it is cheaper to manufacture the alkaloid from damaged tea than coffee. In all the experiments healthy dogs were used, and a warm solution of caffeine of from 2½- to 10-percent. strength was injected into the jugular vein, except in a few experiments, where it was given hypodermically. Reichert reaches the following conclusions:—

1. The pulse-rate may be diminished during the first and last stages of the poisoning, but is generally decidedly increased. During the first stage the diminution is due to a stimulation of the cardio-inhibitory centres in the medulla oblongata and heart, and during the last stage to a direct depression of the heart. The increase in the pulse-rate is due to a depression or paralysis of the cardio-inhibitory centres.
2. Arterial pressure during the first stages of poisoning is generally unaffected or diminished, but occasionally a trifling increase is noted; during subsequent stages it is diminished. The increase is due to a direct stimulant action upon the blood-vessel walls, increasing vascular tension. The diminution is due chiefly to a direct depression of the heart, and, to some extent, doubtless, to a secondary paralyzing action on the vessel-walls.
3. The acceleration of the heart-beats may be accompanied by no appreciable alteration in blood-pressure, but generally by a more or less decided diminution, which is dependent upon cardiac depression.
4. Caffeine diminishes the heart's efficiency for work, arrests it in diastole, sometimes induces sudden paralysis, and is, therefore, a cardiac depressant. The asserted stimulant action upon the circulation is, doubtless, subjective, and dependent upon an excitation of the cerebral centres.

In Reichert's other series¹ upon tissue change and heat phenomena, he finds that these results show, beyond possible doubt, that caffeine increases heat production, and, as a corollary, increases destructive tissue metamorphosis. This being the case, how are we to explain the efficiency of coffee in supporting the system and

enabling the performance of as much, or even more, work under conditions of restricted diet? It may be supposed, as already suggested, that the actual waste of energy is in some way diminished, as, for instance, by a lessened heat dissipation, the quantity of heat thus concerned becoming apparent in work; but this assumption is nullified in the facts just demonstrated,—that both heat production and heat dissipation are increased, and, accordingly, that the actual waste of energy was greater. There seems to be no other explanation than that the virtues of coffee, in the wear-and-tear of active life, are entirely subjective, and depend upon a general excitation of the higher tissues, and chiefly upon its powerful exhilarant action upon the mental processes. The assumed ability of coffee to replace food, or to increase the power for work without corresponding tissue destruction, is consequently entirely deceptive, and the conditions produced by it are comparable to those observed at times in the insane, in hysteria, or in fright, where the individual may be capable of performing prodigious feats of strength and endurance, but, nevertheless, at the direct expense of his tissues.

Semmola and Marcine¹⁵², have also studied the effects of caffeine on the circulation and nervous system. The dog shows a marked tolerance for caffeine. Three grains (0.19 gramme) may be injected subcutaneously in a dog weighing only five pounds, without producing any marked phenomena other than slight increase in the number of the heart's pulsations and increase in the vivacity of the animal and a tendency toward micturition and defecation. To apply these experiments to the proportion of a dose applicable to man, not only the body-weight must be taken into account, but the ratio which exists between the weight of the body and that of the central nervous system on which the caffeine mainly exercises its action. Therefore, in man the dose of caffeine should be three times as much as that which is required to produce an effect on the dog. Doses of 6 grains (0.39 gramme) injected into the subcutaneous tissue of a dog weighing five pounds produce considerable increase in the frequency of cardiac and respiratory movements, with a diminution of cardiac pressure. Doses of 15 grains (0.97 gramme) produce great excitement, which lasts for about two hours, the cardiac pulsations increasing in frequency, the blood-pressure diminishing. Gradually this

action is succeeded by a reduction in the number of pulsations, with increase in blood-pressure and the amplitude of the cardiac systole. Large doses—30 grains (1.94 grammes) or more—some minutes after injection, produce muscular contractions of central origin, which finally pass into complete tetanus. The convulsions, however, gradually pass off, and only a state of great excitement and agitation remain. The heart first has its pulsations increased and pressure lowered, but soon the frequency diminishes to even below the normal amount, and blood-pressure is increased. The action of caffeine is principally exerted upon the nervous system, and, as the result of increasing doses, caffeine ought not to be included among the remedies which act primarily upon the heart. It will be seen that Reichert, Semmola, and Marcine all agree that caffeine is not a direct cardiac stimulant.

According to the recent studies made by Sée and Lapicque,¹⁷ Reichert's belief that caffeine is one of the drugs instinctively desired by man, because of its exciting influences, is greatly strengthened. The French observers reach the following conclusions: 1. Caffeine in small repeated doses, amounting to 60 centigrammes ($9\frac{1}{2}$ grains) per day, may be advantageously prescribed to soldiers on the march, as it increases muscular action and promotes the activity of the motor nervous system, both cerebral and medullary. The result of this double action is to diminish the sensation of effort and to prevent fatigue. 2. It prevents shortness of breath, with resultant palpitation. 3. In this manner it supplies vigor to one who is engaged in severe and prolonged exercise. 4. By producing this excitement of the cerebro-spinal motor system, upon which the increase of muscular tenacity depends, caffeine increases the consumption of carbon in the organism, and especially in the muscles, but does not diminish the loss of the nitrogenous elements, and is not an economizing agent. 5. Stimulation can only be maintained at the expense of the organism. It is by increasing combustion that caffeine promotes muscular activity. 6. Caffeine possesses no mysterious properties that enable it to replace food; it only substitutes the general tonic excitation that is produced by the ingestion of food. Caffeine, far from economizing the reserve forces, cannot enable the exhausted subject to resume his labors, except by using those reserves whose destruction it hastens by excitation of the nervous system. 7. The immediate action of caf-

feine upon the heart and vessels appears to be quite different from what it is generally supposed to be.

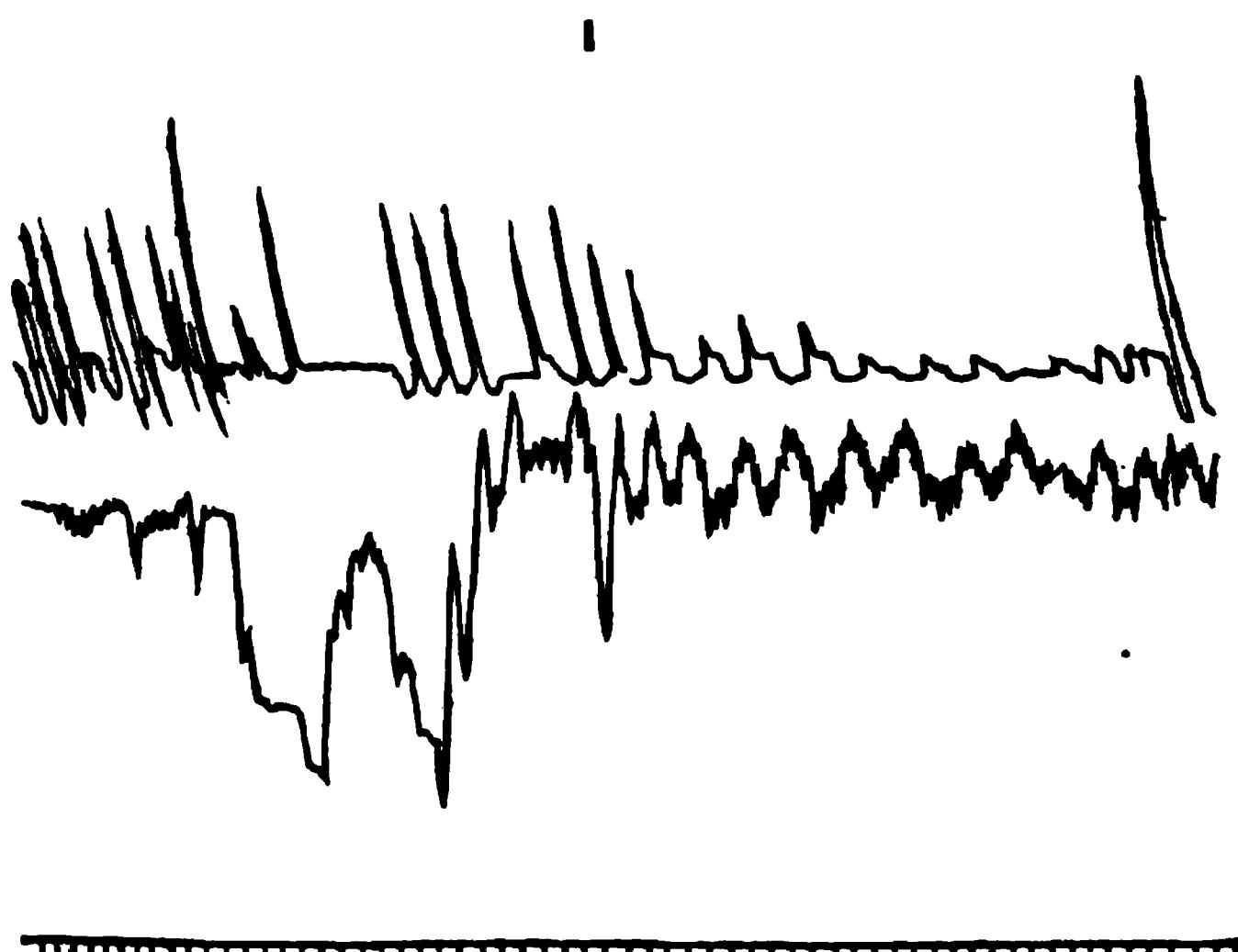
Chloroform.—The years 1889 and 1890 can be regarded as epochs marked by a renewed discussion of the much-mooted questions of the relative value of ether and chloroform, and particularly of the safety of the latter drug. The first Hyderabad Commission published a research which called forth so much criticism that the Nizam at once arranged for a second commission, of which Lauder Brunton was the chief figure, in order to decide the question positively, and to every one's satisfaction. The first commission, which was composed of Hehir, Kelly, and Chamarette, assisted by the students at the Hyderabad Medical School, during 1888 made a series of experiments upon 128 full-grown pariah dogs, to ascertain the method in which chloroform causes death. They varied the doses and the method of administering the chloroform in every way, and tested the value of artificial respiration by reviving the dogs over and over again, after breathing had stopped and while the heart was still beating, and found that, no matter in what way the anæsthetic was given, the heart became dangerously affected only when the breathing had ceased.

The second commission, although headed by Brunton, who was formerly a staunch upholder of the doctrine of the danger of chloroform, came to the same conclusion as the first, to all intents and purposes. Their report to the London *Lancet* was most thorough and complete, and was accompanied by a large number of typical tracings. The conclusions formulated by this commission are given in the department of "Anæsthetics," vol. iii.

The commission has no doubt whatever that, if the rules given be followed, chloroform may be administered in any case requiring an operation, with perfect ease and absolute safety, so as to do good without the risk of evil.

Soon after these results were reached in India, Wood and myself published a study, made in America, which differs from that of the Indian Commission in its conclusions, which are as follow: We believe that physiologists in general hold the opinion that when chloroform is given to the lower animals in a very dilute form, and gradually pushed, it causes, by its action upon the nerve-centres, a paralytic relaxation of the muscles, and, at last, death by paralysis of the respiratory centres; but that when it is

administered freely in concentrated vapor by inhalation, or when it is injected in sufficient amount into the jugular vein, it kills by a paralytic arrest of the heart, the viscus stopping suddenly in its beat and being found after death relaxed and incapable of reacting to stimuli. It has generally been believed that the danger from cardiac arrest by chloroform increases in direct ratio with the rapidity of administration; but that in animals, as well as in man, cardiac arrest sometimes occurs almost at once on the inhalation of the anæsthetic in small amounts; or, in other words, that comparatively small amounts of chloroform have at times caused death by syncope, through direct action upon the heart. A number of

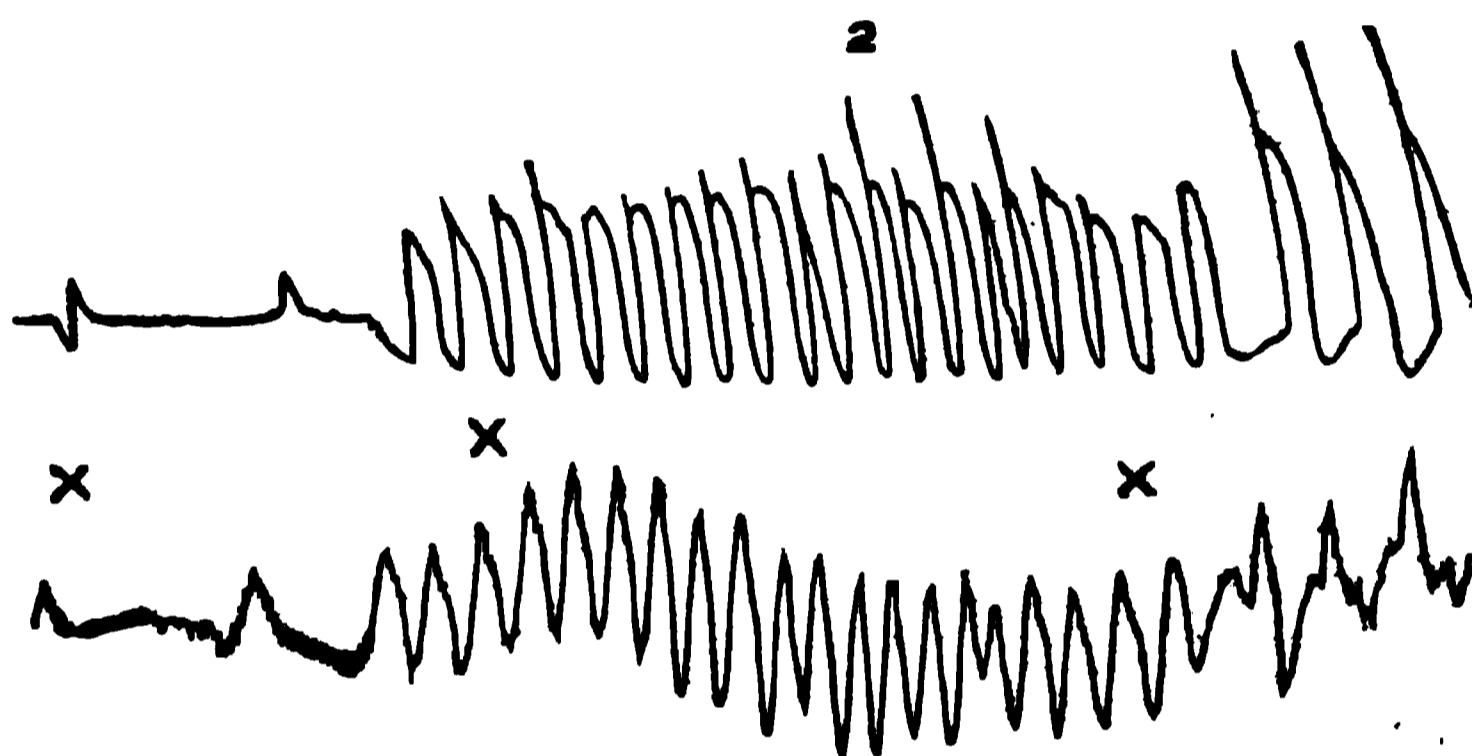


our experiments have been made by injecting the chloroform into the jugular vein; in others it has been administered by the respiratory tract. In all cases accurate tracings have been made by means of the kymographion and the respiratory tambour.

The theory that the vapors of chloroform may, by irritating the larynx and adjacent parts, cause arrest of the heart through a reflex inhibition has from time to time found advocates. To test the possibility of this we have made a number of experiments. When the tracheal canula is tied tightly into the trachea some distance below the larynx, it is evident that the latter organ is isolated from the general respiratory tract, and that chloroform in-

jected into it will exert only a local influence. In all the experiments which we have made in the way just indicated, the injection has been followed by an immediate and very pronounced primary fall of the pressure, succeeded, after a very brief interval, by a rise which usually reaches decidedly above the normal. As an example of one of these experiments, we give the tracing on page 12.

The primary fall of arterial pressure which has just been spoken of can scarcely be produced except by reflex inhibition of the vasomotor centres, whilst the secondary rise is, probably, the result of a reflex vasomotor spasm. In order to throw light upon



VAGI CUT AT FIRST X MARK; CHLOROFORM INJECTED INTO LARYNX FROM
SECOND X TO THIRD X MARKS.

this question, we have made experiments by injecting chloroform into the larynx after division of the pneumogastric nerves, the trachea being ligated so as to prevent the entrance of the anæsthetic into the lungs. (See tracing No. 2.)

In making practical application of the experiments just discussed, it must be noted that in no case have we succeeded in completely arresting the heart's action by injecting chloroform into the larynx, and, as the chloroform was injected in liquid form, it is plain that the irritation was more intense than could be produced by the mere vapors of the anæsthetic, however concentrated; therefore, while it must be considered that it is possible for a reflex

inhibitory arrest of the heart to occur during the inhalation, such an accident is extremely improbable, and we consider it practically certain that a heart so arrested would, a few seconds later escaping from the inhibitory control, recommence its beat. It certainly has never been proven that chloroform can cause in the human subject



SAME CONTINUED; NO BREAK IN TIME.

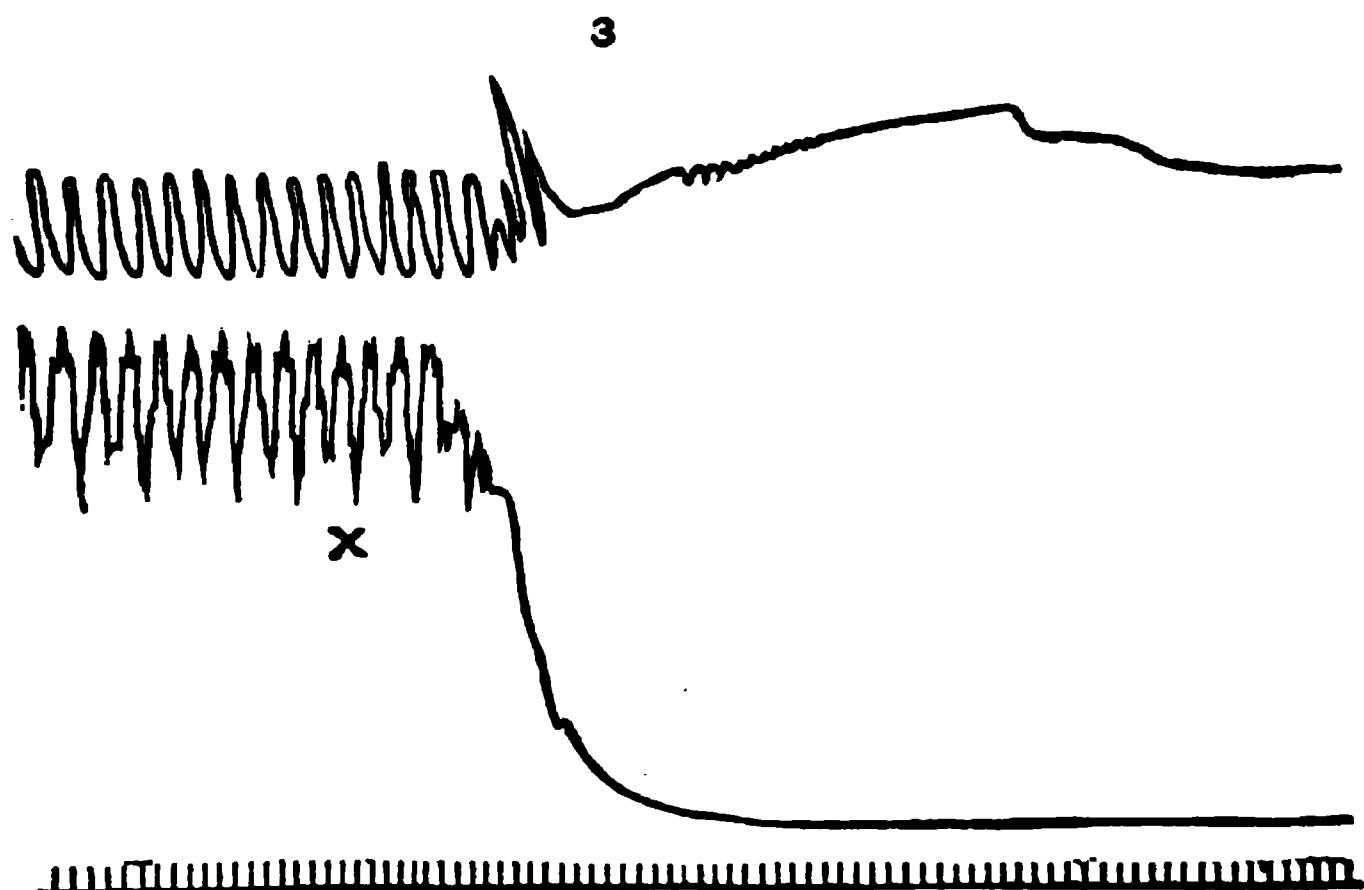


ONE MINUTE LATER.

THIRTY SECONDS LATER.

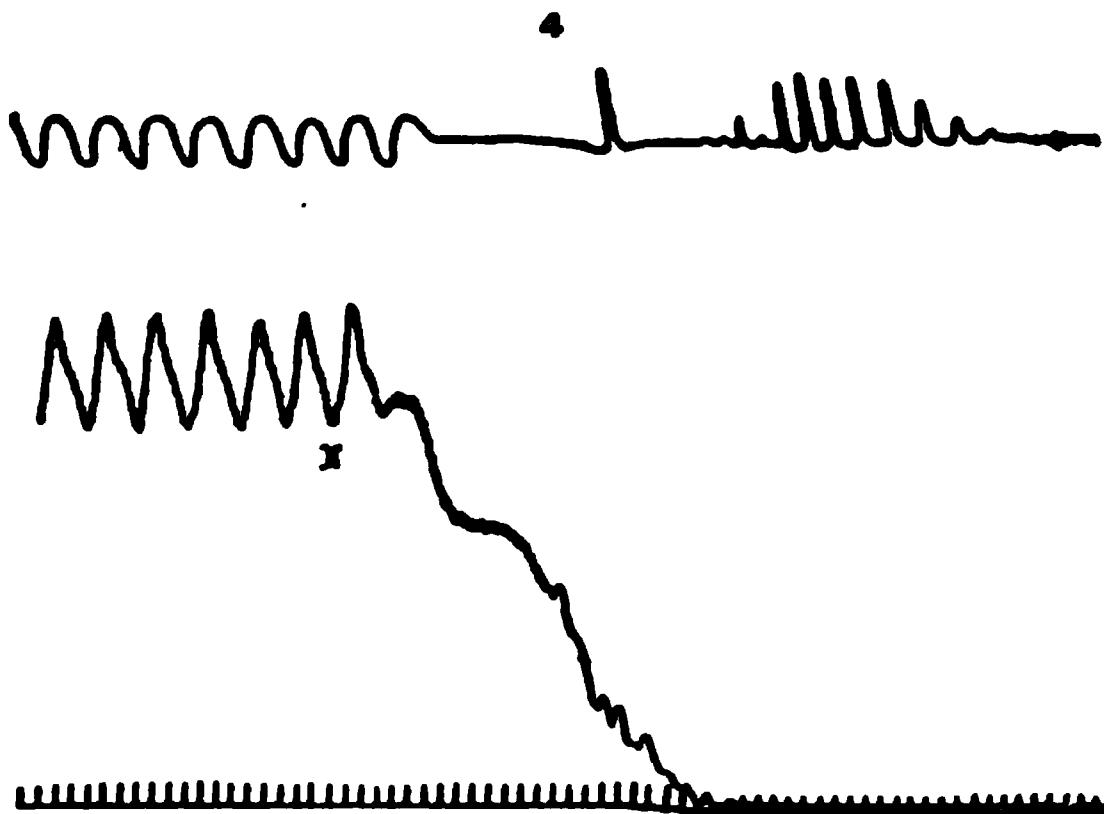
permanent reflex inhibitory cardiac arrest, and, as our experiments upon the dog have failed to cause such arrest, we consider it very improbable that inhibitory arrest is ever produced in man by chloroform. The second series of our experiments were made to determine the way in which large amounts of chloroform, either

thrown into the jugular vein or absorbed into the pulmonic capillaries, cause death. We have found that it is possible for the heart and respiration to be practically simultaneously paralyzed by the anæsthetic (see tracing No. 3). On the other hand, the heart may



Doe; WEIGHT, 10½ KILOS; FULL GROWN; 5 C.C.M. OF CHLOROFORM INJECTED INTO JUGULAR AT X.

be arrested during chloroformization, and the respiration continue, as is shown in the accompanying tracings (see tracing No. 4).

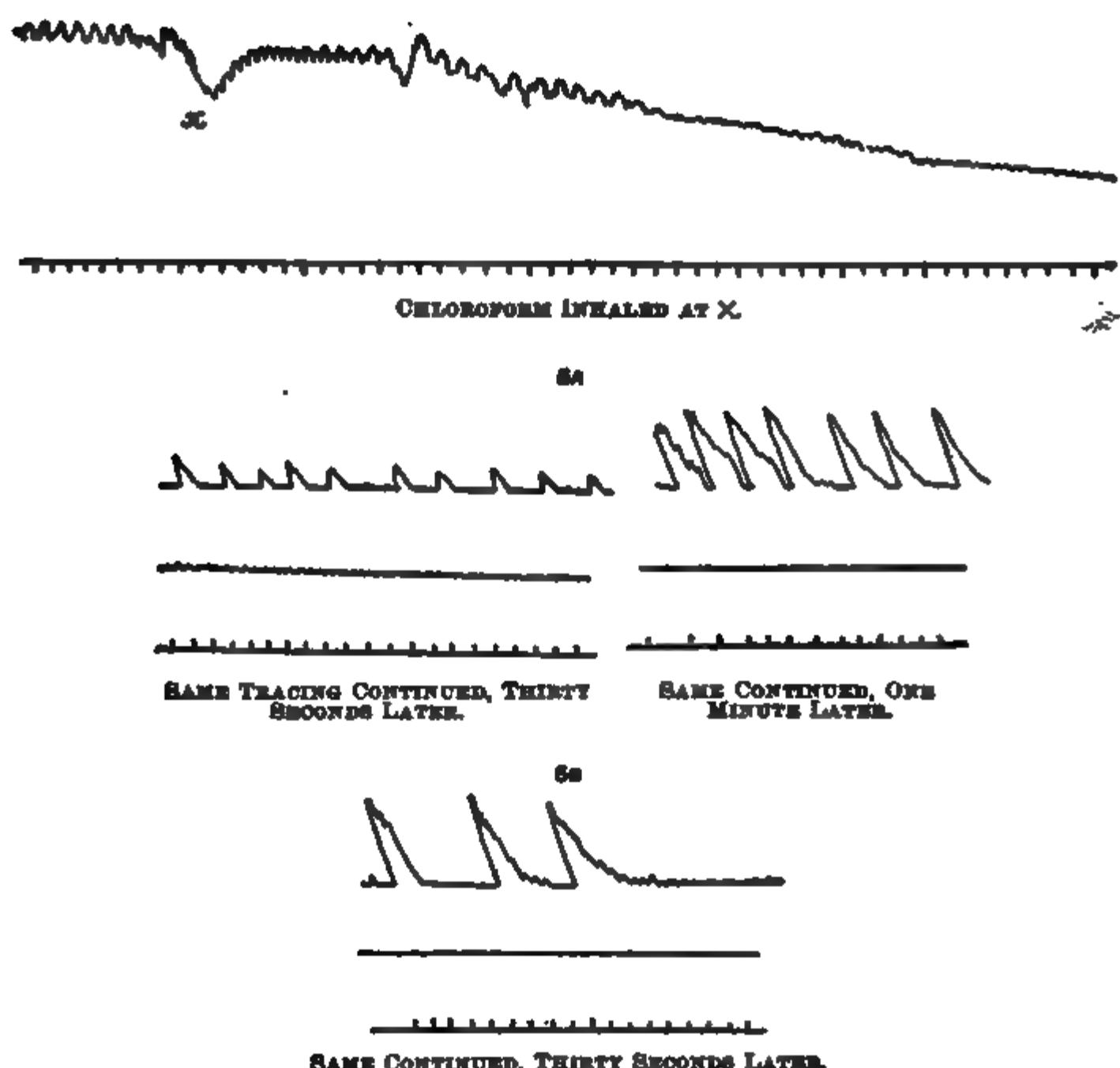


Doe; WEIGHT, 11 KILOS; FULL GROWN; 2½ C.C.M. INJECTED INTO JUGULAR AT X.

We desire to call attention to the fact that, of the two tracings here inserted, one (tracing No. 4) was made by injecting the chloroform into the jugular vein, whilst the other (tracing No. 5) was obtained by the inhalation of chloroform. In the second experiment

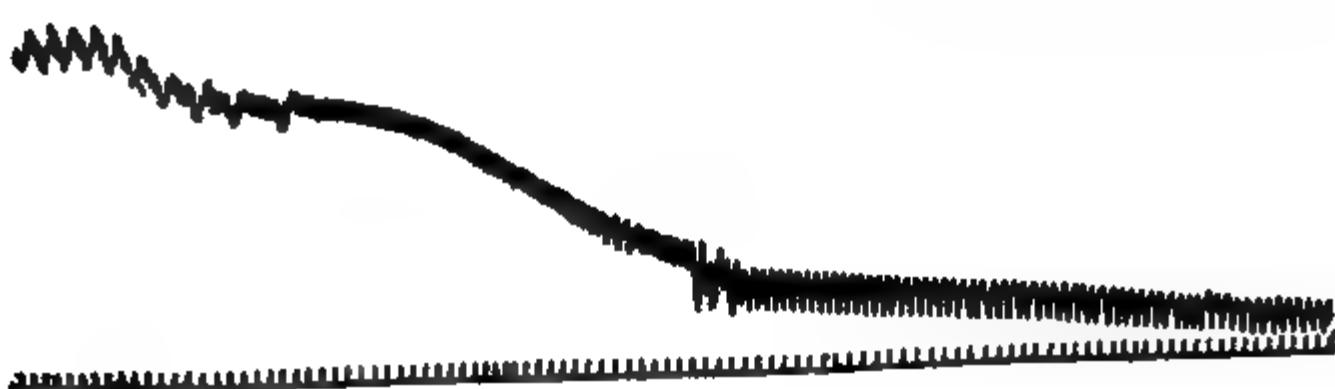
(inhalation) breathing continued two minutes after the heart had ceased to act (see tracing No. 5). The next series of experiments

5

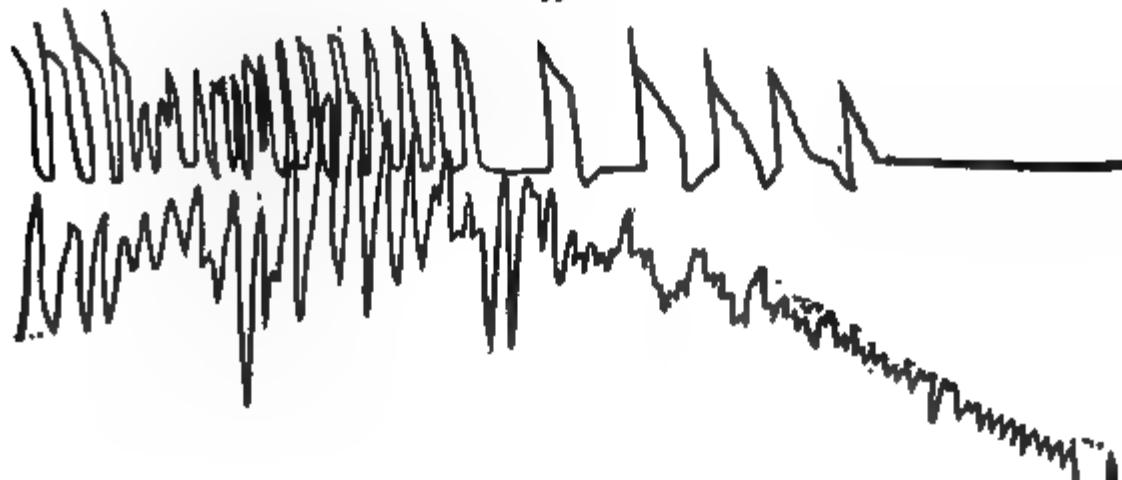


were made with small doses of chloroform. In a number of these cases the respiration ceased long before the heart's action, as is

shown in the appended tracings, in which the heart continued to beat two minutes after the cessation of respiration (see tracings Nos.



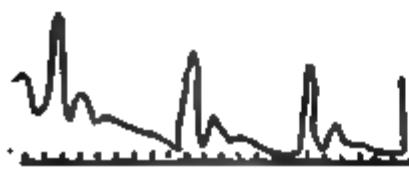
7.



.....

Dog; WEIGHT, 5 KILOS; GAVE CHLOROFORM BY INHALATION, CONCENTRATED
VAPOR.

7A



SAME TRACING CONTINUED, NO BREAK
IN TIME.

7B

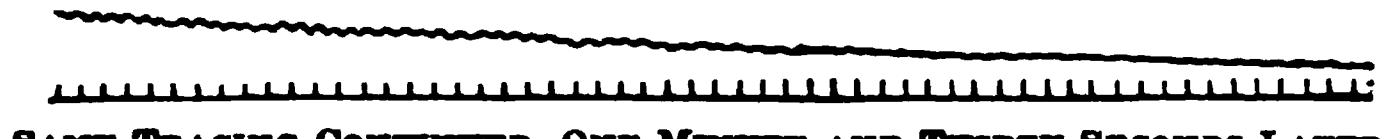


SAME TRACING CONTINUED, THIRTY
SECONDS LATER.

6 and 7). The final series of experiments were made to determine whether chloroform arrests the heart by indirectly affecting the

vagus, or by a direct action upon it. In one experiment (tracing No. 8) the vagi were cut before, in the other (tracing No. 9) after the exhibition of the chloroform. It is evident that the vagal section has little or no influence upon the cardiac action of chloroform which, therefore, acts directly upon the heart and vasomotor

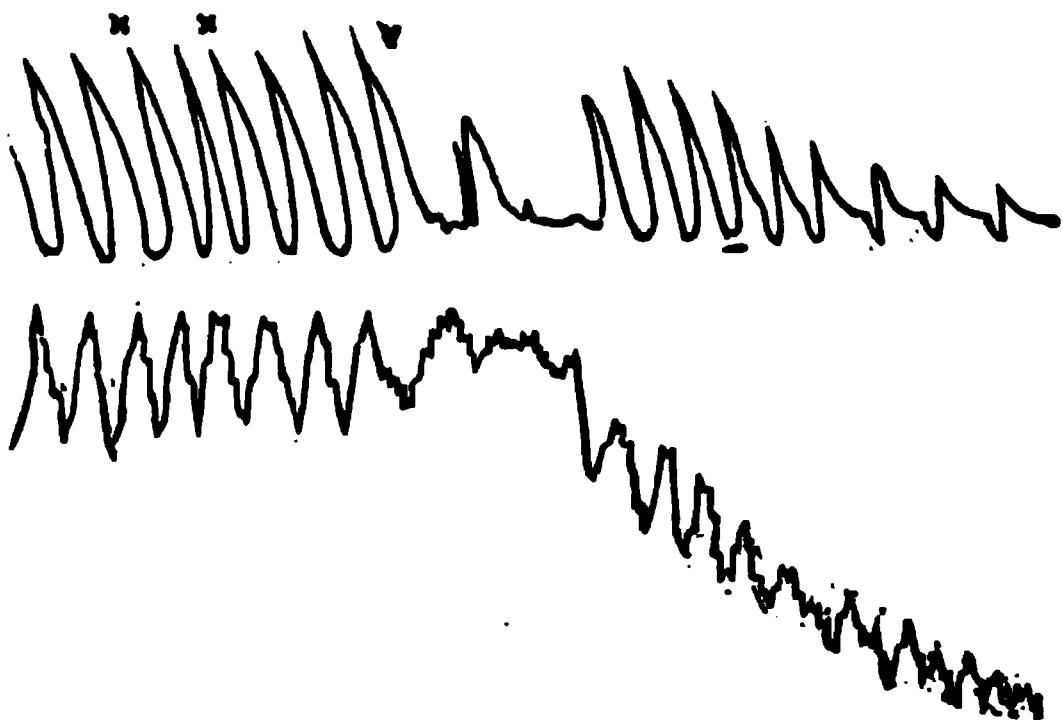
70



SAME TRACING CONTINUED, ONE MINUTE AND THIRTY SECONDS LATER.

system (see tracings Nos. 8 and 9). The experiments show that chloroform acts as a powerful depressant poison upon both respiration and circulation; that sometimes the influence is most felt at the heart, and death results from cardiac arrest; that in other cases the drug paralyzes primarily the respiratory centres, whilst in other instances it seems to act with equal force upon both medulla and heart.

8.

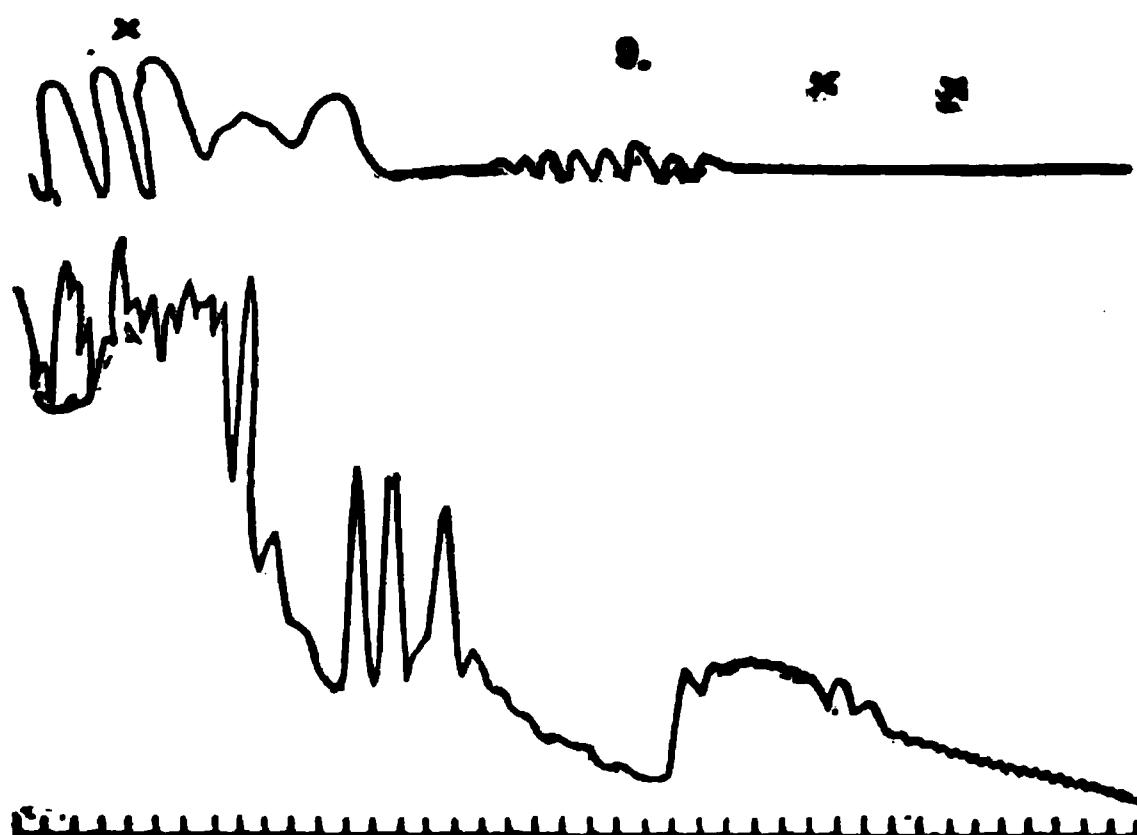


DOG; WEIGHT, 20 KILOS; VAGI CUT AT X; CHLOROFORM INJECTED INTO JUGULAR AT Y.

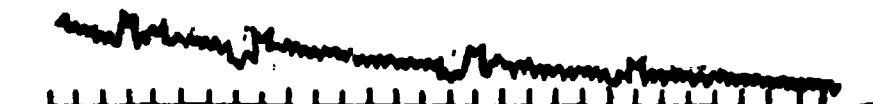
So far as practical medicine is concerned, it makes little difference whether the heart stops just before or just after respiration; so that those cases in which cardiac and respiratory arrests are almost simultaneous are, for the purposes of the clinician, the same as those in which heart-arrest precedes respiratory paralysis. Finally,

the general results of our new experiments also coincide with our previous experience in the laboratory, and with what we believe to be the general opinion of physiologists—that cardiac arrest is specially prone to occur when chloroform is administered rapidly and in a concentrated form.

At the annual meeting of the British Medical Association, held at Birmingham, July, 1890, John A. Williams presented to the Section of Medicine a report upon this subject, and closed his



VAGI CUT AT X X, BUT DID NOT START HEART BEATING AGAIN.



SAME TRACING, ONE MINUTE LATER.

paper with an extended summary of conclusions, as follows: 1. During chloroform anaesthesia the blood-pressure is lowered and the heart's action is weakened. 2. Dilatation of the heart occurs to an appreciable extent, even when chloroform is administered gently, mixed with abundance of air (under 4 per cent. of chloroform vapor in the air). 3. Dilatation may occur even before the conjunctival reflex is abolished. The dilatation affects all parts of the heart more or less—the left side as well as the right. It is not due to changes in the pulmonary circuit. 4. The dilatation is not

due to the accompanying fall of pressure, to the diminished resistance to the ventricular systole, or to the diminished blood-supply through the coronary arteries. Dilatation does not result from a similar fall of pressure, brought about by means other than chloroform; for example, arterial relaxation, caused by section of vaso-motor nerves. Dilatation under chloroform often occurs very quickly before there is any fall of pressure. Moreover, when the dilatation has followed a fall of pressure, it is not removed by artificially raising the pressure; for example, by compression of the abdominal aorta. 5. There is no distinct change in the rate of the heart's action when dilatation occurs. A sudden and complete cessation of the cardiac rhythm is never caused by the inhalation of chloroform. Cardiac failure occurs by a more or less sudden enfeeblement and dilatation of the organ, not by a sudden complete cessation of rhythm. 6. The tone of the heart-muscle is depressed, the cardiac walls become relaxed, and the functional efficiency of the organ is impaired. 7. When the heart becomes greatly dilated it fails to be an effective force in keeping up the circulation, while its rhythmic movement still continues, though so feebly as to be inefficient. 8. Cardiac failure sometimes occurs in this way a considerable time before the respiration stops, though generally the respiration stops before the heart has become incapacitated. 9. The failure of artificial respiration to bring about recovery (in some cases of chloroform collapse), when begun immediately after the spontaneous respiration has ceased, is, in all probability, due mainly to the enfeebled and distended state of the heart, which has become unable to maintain the circulation. Hence, the supply of fresh air (by artificial respiration) free from chloroform cannot be taken advantage of. 10. The depressing influence of chloroform on the heart—leading to dilatation of its cavities—is not exerted through the vagus nerves, but is a direct effect of the drug upon the cardiac mechanism. Section of both vagi does not obviate the weakening and dilating influence of chloroform upon the heart. 11. The weakening and dilating effects of chloroform are sometimes manifested in tolerably equal degree on both auricles and ventricles, but sometimes more readily upon the auricles, and at other times upon the ventricles. 12. A peculiar periodic depression of the ventricular action sometimes occurs during recovery from the primary effects of chloroform. 13. The

contrast between the relation to the heart's action of chloroform and ether in anaesthetic doses is very marked. With chloroform, cardiac dilatation frequently occurs—and often, indeed, a very marked dilatation—before the conjunctival reflex is abolished. With ether, the induction of anaesthesia, with complete abolition of the conjunctival reflex, has not been attended by any noteworthy dilatation; indeed, effects of a stimulating character have sometimes been observed, and the peculiar periodic ventricular depression sometimes following chloroform has been seen to be removed.

14. Under the influence of chloroform a temporary slowing of the heart's action sometimes occurs from asphyxial conditions or from sensory stimulation during imperfect anaesthesia. This slowing is quite different in its nature and causation from the enfeebling and dilating effect already mentioned. The slowing is not due to the direct influence of chloroform on the heart, but is indirectly brought about through vagus nerves. It does not appear to be dangerous in the healthy animal.
15. The occurrence of fibrillar contraction (*delirium cordis*) does not appear to be a primary mode of cardiac failure from the inhalation of chloroform in the healthy animal, though it may sometimes supervene when the heart has become distended and incapacitated by chloroform.
16. The fall of blood-pressure under chloroform is, in its earlier stages, due mainly to the depressing effect of the anaesthetic on the vasomotor centre, preceded often by a slight stimulation; the latter stages are associated with failure of the heart as well as of the vasomotor centre.
17. The relative occurrence of cardiac dilatation and vasomotor depression varies. Sometimes the heart begins to dilate early, before there is any fall of pressure; at other times a large fall of pressure may occur before cardiac dilatation becomes marked.
18. The lowering of the blood-pressure is, in a certain sense, protective; it retards the access of more chloroform to the vital organs. But, on the other hand, the fall of pressure may become excessive and produce dangerous effects.
19. Under certain circumstances, when chloroform is very suddenly taken in, a dangerous dose may be absorbed and the heart may become seriously affected before the vasomotor centre has had time to be much depressed.
20. When a fall of carotid pressure has been brought about by the gradual inhalation of chloroform in the ordinary way, firm pressure applied to the abdomen causes a marked rise of pressure—very much more

than can be obtained by inversion of the animal. And even when the fall of pressure is due to the sudden inhalation of an excess of chloroform, pressure on the abdomen commonly, but not in all cases, leads to a decided rise in the carotid pressure. The existence of cardiac failure may prevent the possibility of such a change, 21. Changes in the respiration exert a most important influence upon the effects of chloroform administration. An amount of chloroform which can be given with safety during easy breathing may speedily become dangerous during deep, rapid respiration. 22. Free dilution of chloroform with air—the restriction of the percentage of chloroform-vapor to 4 or 4½ per cent.—gives no security against an overdose. A percentage that gives safe anaesthesia during ordinary breathing may lead to fatal collapse if given during exaggerated respiration. 23. Changes in respiration may be excited by sensory stimulation (operative interference, too strong chloroform-vapor, etc.) during imperfect anaesthesia. (See Section Q, vol. iii.)

Cocaine.—Ugolino Mosso ⁷⁸⁹ has published a long research on the influence of this drug on the nervous and muscular systems. He finds that cocaine paralyzes the motor nerves and acts on the ganglionic cells of the spinal cord, as is evidenced by the fact that, although the cord remains in physiological connection with all the sensory nerve-trunks and nerve-endings, in poisoning by cocaine the sensibility only remains intact in those parts whose sensory nerves are connected with a section of the cord which has been protected from the action of the cocaine. Mosso shows that cocaine cannot be correctly termed a poison for the sensory system in the same way in which curare is for the motor nerves, since in the advanced stage of poisoning, whenever arrest of respiration occurs, the animals are certain to die and the sensory nerves still retain their function. When the irritability of the nerve-centres of the spinal cord is depressed by the local application of cold, all reflex movements attributable to irritation of the sensory nerves disappear, even although voluntary movements may persist. The action of cocaine, therefore, in this respect offers nothing characteristic, since we may obtain the same effect through the action of cold on the nervous system. In studying the local action of cocaine on the nerve-trunks, Mosso has found that when locally applied to mixed nerves, cocaine prevents conductivity in

both the motor and sensory nerve-fibres. When the great part of the spinal cord is protected from cocaine, sensibility disappears after motility, while the centrifugal conductivity of the cord is destroyed. In doses of $\frac{1}{2} \text{grain}$ (0.00054 gramme) for every two pounds of body-weight of dog cocaine exercises no influence on muscular contraction, while when given in doses of $\frac{1}{4} \text{grain}$ (0.001 gramme) it acts as an irritant, and in doses of $\frac{1}{2} \text{grain}$ a paralysis results. In studies made on the muscular system of man, Mosso has found that when $1\frac{1}{2}$ grains (0.097 gramme) of cocaine are administered by the stomach the muscles are able to accomplish a greater amount of work than in the normal condition. This result obtains solely when the cocaine is slowly absorbed by the gastric mucous membrane, for, if injected in large doses into the blood, cocaine first acts as an irritant and then as a paralyzant to the muscular system of man. On fatigued muscles the stimulating action is more marked than on muscles in the state of rest; while, if given after a prolonged fast the stimulating action is still more marked, and the muscle whose power has fallen below the normal is, under the influence of cocaine, then restored to above the normal degree. Cocaine has been found by the author to increase the quantity of inspired air, from the fact that in small doses it increases the chemical processes in the body; it, however, depresses these processes when given in larger quantities. In small doses it produced marked contraction of the blood-vessels in man, this result being determined by plethysmographic studies made upon Mosso's own arm.

Codliver-Oil, Lipanin, and Butter—Assimilation of, in Healthy People.—Gubkin²⁸ has made an inquiry into a comparative assimilation of codliver-oil, lipanin, and ordinary butter. The experiments were conducted on six healthy young men (medical assistants and students), aged from 20 to 27, and lasted in each case for fifteen days, during the first of which the person experimented upon was taking butter in the daily dose of 60 grammes (1 ounce 7 drachms) containing 52 grammes (1 ounce 5 drachms) of fat; during the next five days, Kahlbaum's lipanin, which is a pure olive-oil, with 5 per cent. of a free fatty acid, in the daily dose of 52 grammes (1 ounce 5 drachms); and, during the last five-day period, Bergen white codliver-oil, in the daily dose of 52 grammes (1 ounce 5 drachms). His investigations may be

summed up thus: 1. The average assimilation of butter amounts to 97.3 per cent. (of the quantity ingested); that of lipanin, 97.21; and that of codliver-oil, 97.12. 2. Therefore, lipanin is assimilated best of the three fatty substances; the second place is occupied by codliver-oil, and the last by butter. 3. Accordingly, the prevailing view, attributing to codliver-oil quite a peculiar assimilability, proves to be incorrect. 4. The oil can, however, be safely substituted by ordinary butter, which, in addition, is by far a cheaper and more savory article. 5. Lipanin, while being expensive, does not offer any advantages over codliver-oil.

Codliver-oil, it is to be remembered, does not do good solely as an oil, but possesses peculiar properties, and can only be compared to other fats when fats alone are spoken of and needed.

Colchicine.—Jacobi¹³,⁸⁰ notes that about two or three hours elapse after the subcutaneous and intra-venous injection of this alkaloid in warm-blooded animals before the symptoms of general poisoning appear. In a dog and cat these symptoms first consist of nausea, and more or less vomiting and diarrhoea. Alterations in the motility, taking on the form of ascending central paralysis, soon appear and are shortly followed by disturbance of the digestive organs. When the paralysis has reached the anterior extremities, disturbance of respiration, which before then had not been affected, now appears. The respiratory movements become greatly increased in power and markedly decreased in number, until death is finally produced by arrest of respiration. In rare cases, immediately before death, convulsions occur, which are attributable to asphyxia. The heart remains beating twenty minutes after breathing has been arrested. On post-mortem examination there is found numerous ecchymoses and haemorrhages in the stomach and large intestine in animals in which the gastric disturbances have been most violent. The most important result noted, however, is that in an absolutely pure condition colchicine is apparently inert in the frog, and it is only in mammals that it commences to act when the colorless crystalline product is transformed into a brown, amorphous, oxidation product, which Jacobi terms oxydicolchicine. In the frog $\frac{1}{15}$ grain (0.0043 gramme) of this product produces convulsions within half an hour, and death results from general paralysis. Jacobi succeeded in producing this oxydicolchicine artificially through the influence of nascent oxygen

on colchicine. He has found that colchicine, employed in arterial circulation experiments on an excised kidney, under the influence of the living tissue, is likewise transformed into oxydicolchicine; and he has determined, from experiments made on separate organs, that the direct action of colchicine—that is, oxydicolchicine—on the circulatory system cannot be the primary cause of death. In the frog, in doses of $\frac{1}{2}$ grain (0.013 gramme), oxydicolchicine produces results similar to those which follow the administration of veratrine, while on warm-blooded animals colchicine oxidization produces both the same qualitative and quantitative results. First there is an irritation of the intestinal wall through stimulation of the nervous organs controlling peristalsis, and this state of stimulation is finally followed by a more or less violent gastro-enteritis; then disturbances of sensibility and alterations in the muscular functions occur, and as a consequence of ascending paralysis of the spinal cord, which finally reaches the motor centres of the medulla, death is produced by the ablation of the function of the respiratory centre. These results on mammals correspond closely to those reached by Ferrer (see last year's ANNUAL), but differ in that the alkaloid was found by the latter to paralyze the sensory nerves in frogs.

Cold.—Grigorowitsch, of St. Petersburg,^{1014 26} has carried out an elaborate course of experiments on 62 young soldiers, suffering either from croupous pneumonia (5 cases), or typhoid, typhus, recurrent, or "mixed" fever (57 cases). Cold (in the shape of an ice- or snow- bag, measuring 25 centimetres in diameter) was applied to the praecardiac region for from four to six hours, the application being continuous or interrupted, with hourly intervals of ten minutes' duration. The results may be briefly given thus: 1. Cold applied to the praecardiac region in the beginning (during the first twenty minutes or so) gives rise to a slight acceleration of cardiac beats, but subsequently markedly decreases their frequency, increases the propulsive work of the heart, and somewhat lowers the body temperature, the respiration simultaneously becoming slower, deeper, and more equal. 2. The effects are fully established in about one or two hours, and last for a few hours after the cessation of the application. 3. The cutaneous temperature in the praecardiac area returns to the standard in about half an hour or one hour after the removal of the ice-bag. 4. A continuous

application acts more energetically than an interrupted one. In some patients, however, the former causes some discomfort. In such cases it is advisable to periodically remove the ice-bag for ten or fifteen minutes. 5. The application appears to prevent (at least, to a certain degree) fatty degeneration of the cardiac muscle under the influence of high febrile temperatures. 6. When the degeneration has already developed, the use of cold fails to produce any beneficial action on the heart. 7. Hence, cold should be resorted to as early as possible for the first days after the onset of febrile disease. The application should be kept up for five, six, or more hours every day.

Corianria Ruscifolia, or Tutu Poison.—Christie⁵⁵⁷ finds, from a long study of this drug, that an overdose causes vomiting, with rapid breathing (180 per minute), followed by muscular twitchings and convulsions which may continue for many hours. The drug, it is stated, acts both upon the brain and spinal cord, and kills by paralysis of the respiratory centre. The entire research contains many opportunities for erroneous results; thus, the statement is made that the motor cortex is affected because convulsions did not occur if these centres were removed; and, again, it is determined that the drug does not act on the peripheral vagi because the breathing was not affected any sooner when the drug was sent into the jugular vein than when it was injected into the carotid artery. Such conclusions, without control experiments, are most uncertain. At the same time the research contains much of interest, and the author has faithfully gone over the botanical and toxicological history of the drug.

Curare.—Dogiel and Nikolski, of Kazan,^{580, 90} have experimentally studied the biological action of curare in dogs, cats, rabbits, pigeons, hens, amphibia, batrachia, reptiles, fishes, crustacea, insects, and amœbas. They have arrived at the following conclusions: 1. Curare is not absorbed by intact integuments (in any of the animal species named), but is absorbed, though with difficulty, by mucous membrane. 2. When introduced into the system, and coming in contact with systemic tissues, the drug develops almost identical biological effects in all animal species. 3. According to the duration of its contact with various organs and tissues, curare may paralyze either the central nervous system or terminations of motor nerves of any muscular structure (including the heart), and

induce alterations of the muscular tissue itself. 4. Motor nerves of voluntary muscles are not affected simultaneously; some suffer earlier, others later, the ocular muscles last. 5. In rabbits and cats curare affects the vasomotor centres less strongly than in dogs. 6. When instilled into the eye, the drug does not dilate the pupil in any of the mammals, but does so in birds. 7. When injected intra-venously in dogs and rabbits, curare produces a slight dilatation of the pupil. The phenomenon, however, is dependent upon the drug's action on certain cerebral centres, but not upon its paralyzing the terminations of the oculomotor nerve in the constrictor pupillæ. 8. In cats the drug paralyzes the cardiac fibres of the vagi far more rapidly than in dogs and rabbits. 9. In mammals, curare causes death by paralyzing the respiratory centres (but not the peripheral respiratory nerves). 10. The proximate cause of the biological effects of curare is, probably, constituted by the drug inducing some alterations in the protoplasm of both nervous and muscular structures, though to a different extent and not simultaneously.

Digitalis and Nitrate of Potassium, Influence on the Assimilation and Elimination of Salts.—Atlasow⁹⁰ has studied this question with the following results: 1. Both digitalis and nitrate of potassium markedly increase the elimination of sodium through the kidneys, as well as its metabolism. The effects of the nitrate surpass those of digitalis. As to the absorption of sodium, it is invariably diminished under the influence of digitalis, but only now and then under that of the nitrate. 2. Digitalis also augments the metabolism of potassium and promotes its elimination with the urine, the effects persisting after discontinuing the drug, but being less constant and by far less pronounced than in the case of sodium. The remedy tends to decrease the absorption of potassium. 3. Nitrate of potassium increases the proportion of potassium in the urine and faeces, the effect remaining still marked even after discontinuing the remedy. The potassic metamorphosis decreases during the period of the administration, but markedly rises in the after-period. 4. Digitalis seems to decrease the absorption of lime, but somewhat augments the metabolism of the latter, as well as its excretion through the kidney. The nitrate similarly diminishes the absorption, though less constantly, and inhibits the metamorphosis and elimination of calcium with urine. 5. Digi-

talis somewhat depresses the elimination of magnesia through the kidneys and its metabolism, but sometimes improves the assimilation. Nitrate of potassium inhibits the latter, but tends to promote the metamorphosis and excretion. Alexeevski²⁵ has undertaken a course of most careful observations on four healthy and well-nourished medical men (including himself), aged from 30 to 34, his aim being to throw some light upon the action of digitalis and nitrate of potassium on the metabolism of water. In each case the experiment lasted for twenty consecutive days, and was divided into five periods of four days' duration. During the first, third, and fifth periods no diuretics were administered, while during a second an infusion of folia digitalis (0.5 gramm—7½ grains—of the latter to 90 grammes—2 ounces 7 drachms 9 grains—water) and during a fourth a solution of nitrate of potassium (4 grammes—62 grains—to 90 grammes—2 ounces 7 drachms 9 grains—water) was given daily (in three equal doses). All the observations were conducted during the summer months. The outcome of the investigations is as follows: 1. Under normal conditions (in summer-time), the amount of water eliminated in the urine averages 44.7 per cent., and that of cutaneous and pulmonary aqueous losses 78 per cent. of assimilated water. 2. Digitalis (in the said doses) increases the elimination of water through kidneys, the surplus varying between 6.6 and 13.4, and averaging 10 per cent. of assimilated water. 3. At the same time the drug diminishes cutaneous and pulmonary losses of water, the decrease amounting on an average to 8.4 per cent. 4. The arterial tension rises. 5. The drug does not appear to have any definite influence on water eliminated with faeces (as a matter of fact, in two experiments the proportion of faecal water proved to be augmented, while in the other two it was somewhat lessened in comparison with a preceding period). 6. The proportion of solid constituents of the urine somewhat increases (about 3.2 grammes—49.1 grains—a day). 7. On the whole, neither the metabolism nor the total elimination of water from the organism undergoes any marked increase; hence, as regards the proportion of water present in the system, the influence of digitalis is about *nil*. 8. Nitrate of potassium in the stated doses similarly increases the amount of the urine, the surplus, in regard to assimilated water, averaging 11.5 per cent., and almost disappearing in the after-period. 9. The

drug simultaneously diminishes cutaneous and pulmonary losses, the decrease averaging 13.4 per cent. (or 5 grammes—1 drachm 17 grains—per kilogramme of the body's weight a day). 10. The blood-pressure somewhat ascends. 11. The proportion of faecal water slightly increases (4 grammes—62 grains—a day). 12. The proportion of solid ingredients of the urine increases on an average 5 grammes (1 drachm 17 grains) a day. 13. On the whole, the metabolism of water remains either unaltered or even decreases under the nitrate.

Very closely allied to these studies are those of Belakow,²⁵ who studied the effects of these drugs on the changes in chlorine, phosphorus, and sulphur, with the following results: 1. Under the influence of digitalis (administered daily in the shape of an infusion made of 0.5 gramme—7½ grains—of the leaves to 90 grammes—2 ounces 7 drachms 9 grains—of water), the metabolism of chlorides, phosphates, and sulphates invariably increases. The increase of chlorides averages 15.1 per cent.; of phosphates, 7.7; of sulphates, 9.0. 2. The effects are observed not only during the period of the administration, but also for some time after discontinuing the remedy. 3. Digitalis does not produce any appreciable impression on the assimilation (absorption) of either chlorides or phosphates and sulphates. 4. Under the influence of nitrate of potassium (taken daily in the form of a solution made of 4 grammes—62 grains—of the salt to 90 grammes—2 ounces 7 drachms 9 grains—of water), the metabolism of the salts is augmented (the surplus of chlorides amounts, on an average, to 11.1 per cent.; of phosphates, 4.6; of sulphates, 9.4). 5. The effects, however, last only during the period of administration. In the after-period, the metabolism markedly sinks comparatively with the preceding period; the metamorphosis of chlorides falls, on an average, 17.1 per cent.; of phosphates, 13.4; of sulphates, 12.1). 6. The nitrate somewhat depresses the assimilation (absorption) of chlorides, as well as phosphates and sulphates (the absorption of chlorides lessens, on an average, 2 per cent.; of phosphates, 4.8; of sulphates, 2.6).

Enemata.—Jankowski^{1009, 25} has repeated the experiments of Aristoff upon the physiological effect of hot enemata, but has extended them to a study of the effects on the whole body. In all, ten experiments were carried out on as many healthy young men, aged from 21 to 24, each observation lasting from ten to

fifteen days, during which an enema was given once daily. The injection was made of 750 grammes (24 ounces 1 drachm) of water at 42° or 43° C. (107.6° or 109.5° F.), and administered by means of Hegar's funnel. The fluid was expelled by the patient in from three to thirty-two minutes, on an average in about eight, the quantity retained in the bowels oscillating between 50 (1 ounce 5 drachms) and 290 grammes (9 ounces 12 drachms), and amounting, on an average, to 1551.8 grammes (49 ounces 7 drachms).

The following are the main results derived from Jankowski's careful and laborious investigations: 1. Under the influence of the enemata, the patient's bodily weight invariably falls, the total diminution, for five enema days, varying in individual cases from 220 to 1540 grammes (6 ounces 8 drachms to 49 ounces 4 drachms), and, on an average, amounting to 845 grammes (27 ounces 1 drachm). 2. The daily quantity of urine increases, the surplus oscillating between $992\frac{3}{5}$ (31 ounces 7 drachms) and $289\frac{4}{5}$ grammes (9 ounces 2 drachms), and averaging $706\frac{7}{10}$ grammes (22 ounces 6 drachms). 3. The specific gravity and acidity of urine are augmented. 4. The daily quantity of water lost through the skin and lungs decreases, though the total amount of water lost through the kidneys, skin, and lungs increases. The relation between the amount of urine and that of cutaneous and pulmonary losses undergoes a marked alteration, while under the normal conditions the former is usually less than the latter; under the influence of hot rectal injections the daily quantity of the renal water exceeds that of the cutaneous and pulmonary one. 5. The daily quantity of faeces increases, while their density is diminished. In other words, the quantity of water eliminated from the system through the intestinal tract is also augmented. 6. Immediately after an injection the frequency of the pulse rises from four to twelve beats in one minute. In ten minutes it somewhat lessens, but still temporarily remains at a higher level as compared with the preceding period. 7. The arterial tension, measured on the radial artery, similarly rises from 18 to 25 millimetres. About fifteen minutes after the enema has been returned the blood-pressure ascends still further, to keep at the level for fifteen minutes. 8. The pulse-curve undergoes a considerable alteration, which points to increased energy of cardiac contraction,

arterial tension, and tone of peripheral vessels. 9. Respiration slightly quickens. 10. In fifteen minutes after an injection the axillary temperature rises from 0.1° to 0.4° C. (0.18° to 0.72° F.), to return to the standard in another fifteen minutes. The cutaneous temperature about the hepatic region similarly increases from 0.1° to 0.6° C. (0.18° to 1.08° F.), to fall somewhat below the normal in thirty minutes after an injection. 11. The facts sketched above unmistakably point out that hot enemata markedly stimulate the heart and modify the distribution of blood in the system. 12. The enemata may be resorted to in certain cases for the purpose of a stimulant.

Ferrocyanide of Potassium.—This salt of potassium has been studied by Combemale and Dubiquet,⁶⁷ who reach the following results: In the dose of 30 grains (1.94 grammes) to each $2\frac{1}{2}$ pounds of the animal's weight, the drug is not toxic, but causes vomiting. Animals which cannot vomit suffer from profuse diuresis after receiving the drug, which comes on in about three hours. In the dog, after repeated administration, the cyanide of potassium produces intestinal disturbances, and vomiting is invariably produced if the dose reaches or exceeds 12 grains (0.78 gramme) for every 2 pounds of body-weight, no matter what may be the degree of the concentration of the solution. No constant effect is produced on the temperature, circulation, respiration, or nervous system. The ferrocyanide is decomposed in the economy, and is eliminated in the urine in the form of ferricyanide, when the dose in the guinea-pig does not exceed 7 grains (0.45 gramme) for every 2 pounds of body-weight. The diuretic action of potassium ferrocyanide appears to depend upon the liberation of the potassium and the conversion of the ferrocyanide into the ferricyanide, and potassium salts are thus immediately formed, whose diuretic properties are well recognized.

Hypnal.—This word has been applied to monochloral-antipyrin, which is a compound introduced into medicine for the production of sleep and alleviation of pain. Another compound of chloral and antipyrin exists as the bichloral-antipyrin. The single compound contains 47 per cent. of chloral and 53 per cent. of antipyrin, and the double 66 per cent. of chloral and 34 per cent. of antipyrin. Curiously enough, the experiments of Gley,¹⁴ seem to prove that both of these preparations are equally

active physiologically, although one would suppose that the bichloral-antipyrin would be the more lethal because of its greater amount of chloral. Hypnal is not a very stable compound, and as soon as it comes in contact with a weak alkaline solution is separated into its two constituents. As a consequence, this separation occurs as soon as the drug enters the blood. Fränkel, after a long and careful study of the drug, believes that it is active in one-third the dose of chloral.

Iodide of Potassium.—At the thermal baths of Bagnères-de-Luchon, Doux,²⁴ had several times, during the past year, occasion to determine the amount of potassium iodide in the urine of a patient ordered to take 8 grammes (2 drachms 3 grains) of the salt daily. The analyses showed the eliminated quantity to be so large and constant that Doux considered that further investigation of the subject would be of interest on account of the wide limits assigned to the size of the dose in treatment with this remedy. He therefore conducted a series of experiments upon himself, taking two 3-gramme (46 grains) doses of the iodide daily for twenty consecutive days, and determined the amount of iodide and urea present in the total quantity of urine passed every twenty-four hours. The salt could be detected in the urine thirteen minutes after ingestion of the first dose, and the daily elimination after the second day remained a nearly constant quantity, being about 90 per cent. of the dose taken; whilst no traces could be detected seventy-five hours after the last dose. At the same time, the normal amount of urea present in the urine was diminished by about one-fifth. The experiments were repeated on two occasions, at two months' intervals, with the same results, but it was observed that the quantity of iodide eliminated did not exceed 60 per cent. if a little absinthe had been taken on the previous day. Doux further states that he was prevented from extending his field of research by the attacks of coryza, epiphora, and maxillary pains that accompanied the daily ingestion of doses varying from 1 to 5 grammes ($1\frac{1}{2}$ grains to 1 drachm 17 grains) of iodide; whereas, no ill-effects were observed to follow a dose of 6 grammes (1 drachm 33 grains), which might have been expected to increase the severity of the symptoms.

Ehlers²⁵ analyzed the urine of patients of both sexes and all ages. He observed that the amount of iodide of potassium

eliminated in the urine was increased in proportion to the dose administered. Observation demonstrated the fact that symptoms of iodism, when they appeared, were caused by the retention of iodide of potassium in the system. The symptoms disappeared soon after the iodide was finally passed in the urine. They occurred when only half the amount given had been eliminated. The author's observations showed that, four or five days after the patient ceased taking the medicine, the traces of iodide of potassium in the urine ceased. Iodide of potassium, on account of its facility of absorption and rapid elimination, appears to be an almost harmless remedy. In cases where doses of 20 grains are administered, iodide of potassium is eliminated in the proportion of 75 per cent. There is no danger to the system, provided the excretive power be, to some extent, normal. Doses containing more than 20 grains seem to be incompletely absorbed.

Iodine and the Iodides, Effect on Blood-Pressure.—The conclusions arrived at by Prevost and Binet,²⁵ after a long series of experimental observations, are: 1. That iodized water and solutions of iodine or iodides do not affect the blood-pressure when injected into the veins. 2. Solutions of iodide of potassium, introduced in the same manner, act like potassium and increase it. In larger doses they provoke a fall in blood-pressure. Iodide of sodium proved less dangerous in this respect, and in large doses produces a temporary increase of pressure, followed by a period of gradual diminution. The authors add that it remains to be seen whether, in diseased conditions and when there is high blood-pressure, the effects would not be more marked. Moreover, the effects of the iodides in the treatment of arterio-sclerosis may possibly be explained by their beneficial influence on general nutrition.

Jequirity.—Klein has shown that the poisonous properties of the seeds of *Abrus precatorius* (jequirity) cannot be due to a bacillus, and Warden and Waddell¹⁰¹⁰ showed it to be due to the action of a poisonous proteid. The proteids in the seeds are two in number,—a globulin and an albumose,—and the present paper, by S. Martin and R. N. Wolfenden, relates to the physiological action of the first of these. The proteids were obtained by extracting the crushed seeds with 15-per-cent. solution of sodium chloride; they were precipitated from this extract by saturation with ammonium sulphate; the precipitate was redissolved by adding water;

and from this solution the globulin was precipitated by dialysis, collected, washed, and dried. The actions ascribable to this globulin are the production of local œdema and inflammation when subcutaneously injected or applied to the eye, the presence post-mortem of petechiæ beneath the serous membranes, and the occurrence of hæmorrhagic gastro-enteritis. It also produces a remarkable fall of body temperature after subcutaneous injection, and in lethal doses it causes rapidity of breathing shortly before death. It has little or no effect on blood-pressure. The activity of this globulin is destroyed by heating the solution to 75° or 80° F. (23.9° or 26.7° C.), the temperature at which it enters into a condition of heat-coagulum. In a second paper, Martin²³⁷,⁸⁰ describes the toxic action of the albumose, which was obtained by precipitating the proteids of the seeds by means of alcohol. The precipitate was allowed to remain under absolute alcohol for several months, the globulin being thus rendered insoluble ; the albumose, however, was freely soluble in water after this treatment. It gave the following reactions : The aqueous solution was neutral to litmus-paper, and gave no precipitate on boiling. Acetic acid, and also nitric acid, gave precipitates which dissolved on heating and re-appeared on cooling. Copper sulphate gave a precipitate soluble in excess of the reagent. Copper sulphate and potash gave a "biuret" reaction. Mercuric chloride gave a precipitate insoluble in excess of the reagent. The symptoms produced by the albumose closely resemble those noticed when the globulin is hypodermically injected. There is gradually-increasing weakness, with rapid breathing and lowering of body temperature, but no convulsions or paralysis. It also causes severe conjunctivitis when applied to the eye. Its poisonous properties are lessened by heating at 70° to 75° F. (21.1° to 23.9° C.), and completely destroyed at 85° F. (29.4° C.). The albumose is not, however, so powerful a toxic agent as the globulin, the dose necessary to produce the same effects being larger. A comparison is drawn between the action of the proteids and those of other poisonous substances of the same class, especially those in snake-venom. The following table contrasts the activity of the venom of various snakes and of abrus :—

Common Adder : Fatal dose in man, .0021 grammme ($\frac{1}{50}$ grain) per kilogramme of body-weight (Fontana).

Australian Tiger-Snake: Fatal dose in dog, .00485 gramme ($\frac{1}{4}$ grain) per kilogramme of body-weight.

Cobra: Fatal dose in dog, .000079 gramme ($\frac{1}{50}$ grain) per kilogramme of body-weight (Vincent Richards).

Globulin: Fatal dose, .01 gramme ($\frac{2}{3}$ grain) per kilogramme of body-weight.

Albumose: Fatal dose, .06 gramme ($\frac{9}{10}$ grain) per kilogramme of body-weight.

Peptic Albumoses: Fatal dose in dog, any dose over .3 gramme ($4\frac{3}{5}$ grains) per kilogramme of body-weight (Politzer).

Liver as a Food.—It seems to be a very general belief that the liver of the calf is of great nutritive value, but that this is incorrect would appear from the studies of Palattchenko,¹⁰⁰⁹ ²⁵ who, after a series of experiments on 14 healthy men, found that liver was absorbed in the proportion of 89.8 to 90.7 per cent., while that of butchers' meat 90 to 97 per cent. is assimilated. According to this author, lungs are almost equal in assimilable amount to liver, for of them 85.7 to 86 per cent. are absorbed. Liver is therefore less nourishing than ordinary meat.

Mercury.—Winternitz,²² who has been studying this subject in Neisser's clinic, at Breslau, has lately given us some of the results of his investigations. In order to get an insight into the subject, it was first of all desirable to determine accurately the quantity of mercury in the tissues at varying periods after the administration of fixed quantities. This could only be done on the bodies of animals, and, in fact, it presented such difficulties that he contented himself with testing the quantity of mercury contained in the urine of patients, taking it in any way, and so drawing his conclusions as to the rate of absorption. His investigation showed that, as regards the excretion of the urine, the method of interstitial injection was far beyond all others. After the injection of insoluble salts of mercury, as much as 4 to 8 milligrammes ($\frac{1}{10}$ to $\frac{1}{8}$ grain) per day was found in some cases. He could not determine whether the symptoms of intoxication were parallel with a diminution in the excretion of the drug. Increased excretion of mercury was not effected by iodide of potassium in doses of even 2 to 3 grammes (31 to 46 grains). No difference as regards excretion by the urine was observed between the insoluble salts, calomel, salicylate of mercury,

and the soluble preparations. A parallelism between the quantity introduced and the curative effect was shown by the quantity excreted, whether the mode of administration was by the mouth, subcutaneous injection, local inunction, or plaster.

Morphine and Opium.—A research which cannot fail to be a pleasure to any one who is interested in pharmacology is that of Dott and Stockman,¹⁰¹¹ upon this alkaloid and its derivatives. They find, in regard to morphine, that the production of nervous depression, followed by tetanic spasms, is not necessarily the sequence of the administration of the alkaloid, but that it is solely a question of dose; that is to say, the drug does not always first depress, then stimulate. In regard to the mooted point as to whether morphine depresses the motor nerves, these investigators have found that it does paralyze the peripheral filaments of these nerves, but only very late in the poisoning, or when the drug is brought in concentrated form in contact with them; and they believe that the sensory nerves, even when large doses are given, are not affected by the drug. Upon the circulation in mammals the alkaloid causes a lowering of arterial pressure, if large doses are given, owing to depression of the respiratory centre. The lethal dose for dogs is believed to be from 0.27 to 0.29 gramme ($4\frac{1}{2}$ to $4\frac{1}{2}$ grains) to the kilo. Using methylmorphine or codeine, Dott and Stockman found its influence closely allied to that of morphine. It paralyzes the motor nerves and causes depression and tetanus, as does the more commonly used alkaloid. The narcosis produced by codeine is less than that caused by morphine, and the lethal dose in rabbits is from 0.06 to 0.1 gramme ($\frac{9}{10}$ to $1\frac{1}{2}$ grains). Codeine is more of a tetanizing agent than is morphine, and ultimately depresses the motor nerves more markedly. Ethylmorphine, or the ethyl ether of morphine, codeine being the methyl ether, was found to have effects exactly similar to codeine, and the results obtained from the use of amylnmorphine were also very similar to those reached with methylmorphine. Acetylmorphine, in its physiological action, very closely resembles codeine, and differs from morphine not only in these particulars, but acts much more vehemently upon the respiratory centres than does the latter alkaloid. Diacetylmorphine resembles codeine, but is apparently a little more narcotic in its effects. Benzolmorphine was found to be virtually identical with that of acetylmorphine;

or, in other words, is closely allied, in its physiological effects, to codeine, with the exceptions named above. Methylmorphine chloride affects the nervous centres much more than the peripheral motor and sensory nerves, which seem to escape its influence, although, if very large amounts are used, they may be paralyzed; but it is to be noted that, if a large enough dose is used to cause tetanus, this convulsive state does not come on unless the motor nerve-trunks are protected, for if the motor nerves are exposed they become paralyzed before the convulsive impulse can travel along them. Methylcodeinum sulphate has the same qualities, but not the same quantitative effects as has codeine. The following summary is of interest: 1. The methyl (codeine), ethyl (codethyline), and amyl ethers of morphine form a group of substances having exactly similar actions. In all, the same hydrogen atom has been replaced in morphine by an alkyl radical; they are, therefore, substitution derivatives. It seems to be a matter of indifference which radical is introduced, so long as it replaces the same hydrogen atom in morphine. In all, the narcotic action of morphine is much diminished, the tetanizing action and the paralyzing action on motor nerves are increased, while the lethal dose (on account of the greater tendency to convulsions) is much smaller. The action is, however, of essentially the same nature as the morphine action; the same parts of the central nervous system are affected, and in the same way as by morphine, but not in the same degree. This is what one would expect from chemical consideration, for in making these substances no profound change has been effected in the morphine molecule, but simply an alkyl radical has been introduced into one of the outlying groups which compose it. 2. Acetyl-, diacetyl-, benzoyl-, and dibenzoyl-morphine form a group of substances having exactly similar actions. In them one or both of the hydroxyl hydrogens of morphine have been replaced by an acid radical. Comparing them with morphine, their action is the same in kind, but differs in degree. Their tetanizing power is much greater, while their narcotic action, although visible after smaller doses, is not nearly so profound. Increase of dose, instead of deepening the narcosis, brings on tetanus. Comparing them with codeine, they induce an equal narcotic effect (rabbits) with about one-tenth of the dose, while a dose of about three times larger is necessary

to induce tetanus. Their depressing action on motor nerves is about the same. It seems quite indifferent which radical is introduced, and whether one or both of the hydroxyl hydrogens are replaced. Just as with codeine and its analogues, no great change has been made in the morphine molecule, but simply in the outlying hydroxyl groups. 3. In morphine-sulphuric acid and nitroso-morphine, the radicals HSO_3 and NO replace the hydroxyl-hydrogen atoms, and the action is modified much in the same way as by the introduction of other acid radicals (2). 4. Chlorocodide and trichloromorphide are chlorine derivatives; in the former Cl replaces the OH of codeine, while in the latter both hydroxyl groups, and in addition one H atom of morphine, have been replaced by three Cl. They retain the characteristic actions of morphine on the nervous system, but are, in addition, marked muscle poisons. 5. In metho-codeine two methyl molecules have been introduced into morphine, one of which replaces a hydroxyl-hydrogen atom, while the other replaces an H in the body of the morphine molecule. This completely alters the character of the action, as metho-codeine has the action of a muscle poison (like apomorphine). 6. Methylmorphium chloride and methylcodeium sulphate are addition products, formed by adding methylchloride and methylsulphate respectively to the intact morphine or codeine molecule. The action is not profoundly altered by the chemical change. The paralyzing action on motor nerves is considerably increased and the narcotic action is lessened, but qualitatively the effects on the animal organism remain similar to those of morphine or codeine. The chemical change made in the intimate structure of the morphine molecule has not been profound; there has been simply the addition of a radical, and hence one would scarcely expect the action too much altered. 7. Other morphine and codeine derivatives which have been examined by other investigators seem to retain essentially the morphine action. With regard to morphine, it seems certain that, so long as the chemical changes are restricted to what may be called the outlying groups of the molecule, very little alteration takes place in the physiological action. The change which does take place does not depend so much on the substituting body as on what part of the molecule is substituted. When a change is made in the kernel or ground-work of the molecule, then the action is much more profoundly altered.

Three other researches upon these important drugs have been made during the past year, one by Tauber,²⁷³ upon the excretion of morphine, one by Abutkow²⁵ on the action of opium and its alkaloids upon the stomach, and a third by Wormley¹¹² on the recovery of morphine from the urine, blood, and tissues.

Tauber, in order to ascertain whether morphine became altered in the blood or viscera, added a solution of the alkaloid to blood, and circulated the mixture through the livers and kidneys of recently-slaughtered pigs. This method has already given reliable results with other substances. He found, however, that the morphine could be recovered entirely unaltered, and hence concluded that the alkaloid suffers no change in the body, and is therefore excreted unchanged. The most probable method of excretion is by the bowel, and this he proceeded to prove by giving a dog frequent hypodermic injections of morphine in small doses. From the animal's faeces he recovered 41.3 per cent. of the ingested morphine. Allowing for unavoidable loss and for what is excreted in the urine, it is evident that the greater part of morphine which is given hypodermically becomes excreted into the intestinal canal. Wormley found very notable amounts of morphine in the urine when this drug was given by the stomach, and, as his studies were very accurate and the methods employed by Tauber were crude, the results of the last-named investigator are not to be relied upon to the distrust of the conclusions reached by Wormley. The researches of Abutkow show that opium and its alkaloids retard gastric digestion by decreasing the quantity of hydrochloric acid, but do not inhibit the action of the milk-curdling ferment. They also decrease absorption. It was found that opium was the most powerful in its influence on the stomach, that morphine stood next, and codeine was the weakest. These experiments agree in most of the details with those of Netchneff and von Anrep, and the practical deductions to be drawn are that opium and its alkaloids ought to be given several hours after meals, unless the patient happens to be suffering from an abnormal increase of the hydrochloric acid, when they should be given with the food.

Nitrous Oxide.—This much-used anæsthetic has been carefully studied during the past year by Wood and Cerna,⁸⁰ who find that the gas causes a rise of arterial pressure, followed by a fall, the rise being due to vasomotor stimulation and the fall to vasomotor

palsy. There is also a marked slowing of the heart, which they believe to be due to stimulation of the inhibitory centre in the medulla oblongata. Finally, the slow pulse is changed into a very rapid one, due to vagal palsy. The question which is of the greatest interest is as to the cause of the anaesthesia produced by this gas, and the experiments of these investigators prove that it is due to asphyxia; for, if enough oxygen is inhaled simultaneously to equal the proportion of oxygen in ordinary air, anaesthesia does not appear. The interesting fact was also developed that this addition of oxygen prevented the rise of arterial pressure usually produced by the gas, but did not interfere with the changes in the pulse-rate and force. For this reason Wood and Cerna believed that the action of the remedy upon sensation and the vasomotor system is separate from that upon the heart and its supplying nerves. Leaving nitrous oxide, the study of nitrogen was taken up, and it was found that nitrogen acts as an anaesthetic as rapidly as does the nitrous oxide, the general physiological action being similar, and differing in degree rather than in kind. The changes in the blood resemble those caused by ordinary mechanical asphyxia. In studying oxygen it was found that the pure gas has no influence upon the circulation, and Wood and Cerna therefore conclude that it must be solely the absence of carbonic acid which permits a fall of arterial pressure in apnoea from prolonged forced inspirations, in the same way that a rise of pressure follows an excessive accumulation of CO_2 in the blood. To determine this point, a series of researches upon CO_2 were inaugurated and the following conclusions reached: carbonic acid, when breathed into the lungs alone, sometimes causes a slight and temporary rise in the arterial pressure, but usually at once, and always after a very short time produces a very decided fall of arterial pressure; carbonic acid, when taken properly diluted, distinctly increases the arterial pressure by stimulation of the vasomotor centre, apparently having the most power when mixed with oxygen in the proportion of 2 to 1. The large, slow pulse which was found to follow inhalations of nitrous oxide is due to stimulation of the vagus nerves.

To the inhalation of hyponitrous oxide are ascribed the production of albuminuria and of diabetes. Lafont, experimenting upon himself, asserts that after two successive inhalations, a few

minutes apart, he found in his urine, in two hours, 1.65 grammes ($25\frac{1}{2}$ grains) of sugar to the litre; in six hours, 18.4 grammes (4 drachms $44\frac{1}{2}$ grains); on the third day, 3.95 grammes (1 drachm), and on the fourth day none. In experiments with dogs he obtained, in one hour after the administration, as much as 14.285 grammes (3 drachms 40 grains) of sugar to the litre.

Woodward and Hand,¹¹² in five experiments on healthy men, two being performed on themselves, have failed to obtain any evidence of the presence either of sugar or albumen in the urine. In two instances unconsciousness was produced three times in succession, the first administrations in each being prolonged until the appearance of decided cyanosis. In all cases complete anaesthesia was apparent, and in one instance a tooth extracted. The urine was examined before administration of the gas, and was collected fractionally for the twenty-four hours following, and repeatedly tested with Fehling's solution for sugar, and with heat for albumen, the nitric-acid ring, with acetic acid and potassium ferrocyanide.

Oxygen.—Krafft,³¹⁹ finds that with inhalations of oxygen no changes take place in the quantity of urea and uric acid excreted from the body, but that the total amount of nitrogen excreted increases under the influence of the inhalations about 5 grammes (1 drachm 17 grains).

Protopine.—Von Engel,²⁷³ describes the action of protopine, an alkaloid present in opium in minute amount, and discovered by Hesse in 1870, but which has only now been submitted to pharmacological investigation. In frogs small doses have a narcotic action, while larger amounts act as poisons to the voluntary muscles and motor-nerve terminations, thus greatly obscuring any symptoms of increased reflex. The heart is slowed and weakened. In mammalia no narcotic action was ever observed, the animal being uneasy and restless after small doses, and having convulsions after larger ones. The circulation was very much depressed, but there were no prominent symptoms of any action on the respiration. Owing to the very small amount of protopine in opium, it is extremely doubtful if its presence can have any effect when opium is administered in therapeutic doses.

Purgatives and Peristalsis.—Brandl and Tappeiner,²⁷³ have shown that many of the purgatives not only increase the rapidity

of peristalsis, but also increase its force. Notable among these was senna, which seemed to act chiefly on the lower bowel.

Saccharin.—Plugge⁵⁸³ has made a series of experiments to determine whether saccharin has any influence on salivary digestion,—whether it arrests the action of ptyalin, of pepsin, or trypsin. He finds that saccharin is allied in its action to salicylic acid. It is not a food, and is eliminated by the urine without undergoing any material change. A 3-per-cent. solution of saccharin arrests the action of ptyalin completely, and a 2-per-cent. solution retards the action for ninety-six hours. Saccharin retards the digestion of albumen in the stomach and intestines, and, to a less extent, pancreatic digestion. Plugge is of opinion that saccharin is not admissible as a substitute for sugar, especially in cases of diabetes, when the entirety of digestion is most essential. This substance has also been studied by Sawitzki,²⁵ who attempted to discover its influence on the metabolism of proteids. The author found that:

1. The assimilation of proteids is somewhat increased under the influence of saccharin, the surplus of the nitrogen assimilated varying between 0.55 to 5.78 per cent.
2. At the same time, however, the nitrogenous metamorphosis considerably sinks, the decrease varying from 4.57 to 16.32 per cent.
3. Since saccharin possesses (a) the power of weakening and even totally inhibiting the action of non-organized ferments (diastase, ptyalin, pepsin, trypsin, etc.), and (b) leaves the system in an unchanged form, being eliminated through the kidneys alone, the said depression of the proteid metabolism must be attributed solely to an inhibiting action of the substance on those cells which are taking an active part in the metabolic processes.
4. It is obvious, then, that saccharin cannot possibly become an article of daily human food, for the said depression of the metabolism, when chronic or permanent, cannot fail in the long run to prove injurious to the consumer's organism.

Isaak J. Vinokuroff has recently investigated the effects of saccharin on the assimilation of fats. Of 7 healthy young men experimented upon, in 3 the effects proved to be *nil*, while in the other 4 the assimilation improved, on an average, 1.3 per cent.

Salicyl and Iodine.—Rosenbach and Pohl⁴ have studied the relation of these substances to effusions. They find that the

fundamental difference, then, between iodine and salicyl is that the latter, however given, is found in all serous cavities and in the urine; whereas, iodine, given by the mouth in the usual doses, passes only into transudations, but never into joint-cavities, whether normal or inflamed. The therapeutic consequences are self-evident.

Salol.—The fact that salol is by no means a harmless drug, even when taken in moderate amounts for a long time, has been proved by Hesselbach¹⁵ in a series of experiments, published during the past year, in which he finds, as one would suppose, that it is the 40 per cent. of phenol present in the drug which renders it noxious. He also shows that the drug seriously affects the kidneys and is particularly to be avoided if any renal trouble already exists. He says: “Comparing the renal changes produced by phenol and by salicylic acid, the former leads to anaemia of the kidney and acute fatty degeneration of the epithelium of the convoluted tubules, the latter to hyperæmia of the kidney and haemorrhage into the interstitial tissue and the tubules, followed by a comparatively slight epithelial degeneration. Phenol acts primarily on the cortex, attacking the medullary portions, but only when in large quantity extends its action to the cortex.” It requires large doses of salicylic acid to produce any renal change; that is, doses so large as to be capable of producing death by other than a renal effect.

Selenious Acid.—This acid may be said to wage a war with microbes only when present in a solution in large amount, for the acid itself is destroyed if a solution of less than 2 parts to 1000 are used. Chabriac and Lapicque⁷⁴ have found that selenious acid, in an aqueous solution exactly neutralized by sodium, kills dogs when administered in doses of 3 milligrammes ($\frac{1}{2}\frac{1}{2}$ grain) to the kilo of the animal's weight, and that the post-mortem examination under these circumstances showed extensive inflammation of all the viscera. During the continuance of life frequent vomiting and purging occurred, and there was a marked and constant fall in arterial pressure, the heart being finally arrested in diastole. The respirations are of the Cheyne-Stokes type and the lungs rapidly fill with mucus. These investigators also found that an animal which had received the poison, and which weighed 10 kilos (about 20 pounds), vomited nearly 3 drachms (11.66 grammes) of a limpid

liquid which rapidly coagulated in the presence of atmospheric air, but contained no selenium.

Stimulants.—Reichert,¹¹² in a very interesting paper, gives the following reasons for the universal use of alcohol, tea, coffee, coca, maté, kola, guarana, hemp, tobacco, and opium. It seems clear that the virtues of this remarkable class of substances are due to three chief factors, one or more of which may be characteristic of each member: the production of mental exhilaration, the excitation of the energy-yielding processes, and the ability to furnish energy through their own decomposition. They in common possess the power of causing mental excitement, which differs greatly in degree and appreciably in its nature, some of them affecting chiefly the imagination and others the reasoning faculties. While the condition of the mind is favorable for the manifestation of the peculiar phenomena evinced, and is doubtless the essential factor in the actions of opium and tobacco, it is evidently but secondary with the preparations of alcohol, and with the cocaine- and caffeine-bearing substances. Thus, the preparations of alcohol also tend to diminish the destruction of the tissues by supplying through their own disintegration the deficit of energy thus resulting, and may produce an enormous increase in the powers of endurance and of the ability for work, even where tissue change is at its normal standard, by supplying from their own potentially-laden molecules the excess of energy demanded. On the other hand, those agents which depend upon cocaine or caffeine for their activity, while of themselves incapable of yielding energy, so powerfully excite the energy-yielding processes that the tissues are consumed at a correspondingly quickened pace, and the store of energy is proportionately dissipated. Figuratively speaking, alcohol is fuel added to the fire, and to the extent of the energy which it can yield will save the fuel or add that much energy; but cocaine or caffeine acts as a forced draft, supplying no energy in themselves, simply causing the fire to rage more fiercely.

Strontium, Barium, and Calcium.—After a comparative study of the chloride and lactate of strontium, Laborde,¹⁶⁴ calls attention to their almost perfect innocuousness. He pursued his studies principally on the dog, and, in 1 case, on man, employing intra-venous, endermic, and intra-muscular injections, and also introducing it into the stomach by means of an œsophageal sound; and

he now believes that his results warrant him in stating that the chloride of strontium is absolutely innocuous, he having given it in the dose of $7\frac{1}{2}$ grains (0.482 gramme) to a rabbit weighing only 5 pounds, without producing any appreciable phenomena whatever, even no local disturbance. So, also, in the dog he has given 15 grains (0.97 gramme) of the chloride of strontium directly into the vein, without likewise producing any apparent disturbance, either of the circulation, respiration, or the digestive functions. So, also, 30 grains (1.94 grammes) of the carbonate of strontium were given daily without producing any discoverable effect. In comparing the actions of the chlorides of strontium and barium, one would at first expect, from their chemical relationship, that there would be a somewhat close analogy between their physiological properties; but Laborde has found that the chloride of barium possesses strong toxicity, while, as we have seen, the chloride of strontium is practically inert. He has found that, when a solution representing about 2 grains (0.13 gramme) of the chloride of barium was injected into the external saphenous vein of a dog weighing 30 pounds, the pupil was dilated, the urine abundant, and death was produced by arrest of the respiration; so that Rabuteau's experiments, which attribute death to arrest of the heart, are explainable as due to his method of investigation, and not to the action of the drug. Laborde, therefore, describes the chloride of barium as a respiratory or medullary poison, and not as a cardiac poison. Further, he has noted that, as a result of poisoning with chloride of barium, there is the same arterial hue of the blood preserved as is the case in poisoning by oxide of carbon. Again, in comparing strontium salts with similar salts of potassium, while the former are free from any marked poisonous action, the chloride and sulphate of potassium, as is well known, produce paralysis of sensibility and motion, collapse, and asphyxia, while first producing slowing, and, finally, arrest of the heart. These results follow whether the salts are given intra-venously or through the stomach, though in the latter case there are marked gastro-intestinal symptoms, such as diarrhoea and vomiting. Again, Laborde finds that the salts of strontium and calcium are very closely allied in innocuousness, though chloride of calcium may produce vomiting when injected intra-venously, a result which never follows the use of the chloride of strontium. Finally, in comparing

the action of the lactate of strontium and potassium, the same results were obtained ; that is, the strontium salts were innocuous, potassium salts poisonous. Laborde, however, claims to have noted a result obtained in his experiments which may be of interest for therapeutic applications, and that is that the administration of the lactate of strontium by the stomach to the dog produces marked diuresis. The practical result now is that strontium salts are apparently negative in their action as regards any poisonous effects, while lactate of strontium possesses certain properties as a diuretic.

Strychnine.—The action of this alkaloid upon the cerebral cortex has been very carefully studied by Biernacki,⁵²⁰ _{v.10, p.222, 116} and he finds that, instead of stimulating the cerebral cortex, strychnine depresses it, rendering its response to stimuli very faint. He also observed that the cortical sedation began with the onset of spinal irritation, and concludes that the drug does not act on the brain so much as on the cord, and so indirectly affects the cortex of the cerebrum.

Sugar.—Albertoni⁷⁹⁴ _{v.10, p.226} has found that the amount of sugar which can be absorbed from the alimentary canal of the dog is about 60 grains (3.89 grammes) in an hour, which is about the amount of sugar of milk that an infant can assimilate in twenty-four hours. After the first hour the absorption of sugar is quite slow, and progressively decreases as each hour goes by. If the sugar is placed in the stomach in solution, the organism abstracts the sugar and leaves the liquid, thereby rendering the solution weaker in its saccharine constituents. If an intra-venous injection is made, the frequency of the pulse increases by from 15 to 20 beats to a minute, and in man the internal use of this food in the dose of 100 grains (6.48 grammes) has a similar but less-marked effect. These changes in man come on in from fifteen minutes to one hour, according to the rapidity of absorption. If nausea occurs, then the pulse becomes slowed. All the substances resembling glucose seem to have these influences, such as maltose, saccharose, etc., and all of them raise arterial pressure as much as 15 or 20 millimetres of mercury. The question at once arises, Is this rise of arterial pressure due to a stimulation of the vasomotor centre, or upon depression of the vagi? Albertoni has found that the rise occurs whether the heart is free from vagal influence or not, and

if the vasomotor centre is destroyed. The increase in pressure and pulse-rate must be due, therefore, to a direct stimulation of the heart. In the course of these studies, the interesting fact was discovered that the kidneys always become congested or swollen when glucose or maltose are injected into a vein, as was shown by the use of a Roy's oncometer, and that both of these substances cause equally severe glycosuria. The practical conclusions which are drawn from this research are that sugar is both a food and a stimulant, and that its constant presence in the blood results in cardiac stimulation antagonizing poisonous principles of a depressing type absorbed from the intestinal canal.

Several studies of the action of sugar and sugar of milk, when present in the body, have been published. Duran²⁸ has endeavored to discover whether sugar (glucose) is ever eliminated by the skin and salivary glands, either in health or disease. On going over the literature, two points became evident, namely, that such an elimination does not occur in health, and that much difference of opinion exists among clinicians as to whether such an occurrence ever takes place in diabetes. Claude Bernard has never seen an instance in which glucose was eliminated in this way. Pavy has found sugar in the saliva, but not in sweat. It is stated that Brouardel once saw a merino shirt which had been worn by a diabetic, and which was so stiff with the sugar cast off with the sweat that it was as if starched. A very interesting experiment made by Vulpian gave negative results, but might give positive results in another case. The investigator gave a hypodermic injection of pilocarpine to a man suffering from diabetes, in order to determine if the diffuse diaphoresis which followed would be sugar-laden; but, as just stated, no sugar was found. It is probable that the presence of sugar in the sweat is a possible, but rare, occurrence, which is more common in regard to the saliva, and that the rapidity of the formation of glucose has much to do with such phenomena. Duran's conclusions are as follow: 1. Sugar passes with difficulty from the body in perspiration, but very rapidly by means of the saliva. The quantities which escape by these channels are, however, very small, and are only appreciable in advanced and well-marked cases of the disease. 2. That the testing of the saliva for the presence of glucose, by means of the ordinary tests, is liable to error, in view of the fact that the

microbes, which are always present in the mouth, may so alter the sugar, as soon as it enters the oral cavity, as to render its detection an impossibility. 3. A sulphocyanide in the saliva may render Gerhardt's iron test for acetone untrustworthy.

According to a series of experiments carried out by Dastre, sugar of milk, when given intra-venously, causes glycosuria, and Loyer has found that the substance is not absorbed as such, but previously altered. In order to elucidate this matter, Bouquelot and Troisier,¹⁰¹² have repeated these researches, and find that in diabetes the quantity of sugar eliminated corresponds with the amount ingested, and, as the eliminated sugar is in the form of glucose, they believe that glucose is the form into which all sugars are changed before they are utilized by the body. If sugar of milk is taken in moderate amount, digestion and assimilation are equal; but if the amount digested is very great, or diabetes—that is, faulty assimilation—is present, then glycosuria, temporary or permanent, ensues.

Sulphurous Acid and its Salts.—Pfeiffer⁹⁰ finds that from $\frac{1}{6}$ to $\frac{2}{3}$ grain (0.011 to 0.044 gramme) of sulphite of sodium, injected subcutaneously, is the lethal dose for frogs. It paralyzes the nervous system and the heart-muscle. First the voluntary and then the reflex functions are abolished; the peripheral nerves are afterward paralyzed, and, finally, the muscles. The paralysis of the heart-muscle is generally complete before that of the nervous system. The heart is at first arrested in diastole and distended with blood, but later on the ventricle is found pale, rigid, and contracted,—a condition which Pfeiffer says is not connected with the general muscular rigidity setting in some hours later. In warm-blooded animals, the lethal dose, if the drug be injected subcutaneously, is from 9 to 25 grains (0.58 to 1.62 grammes) for every 2 pounds of body-weight. Rabbits and guinea-pigs gradually become lethargic, the respiration becomes impaired, and the heart-beats are slow, though fairly strong. Suddenly cramp-like twitchings of the body set in, and after a few superficial respirations the movements of the heart and respiration cease. The ventricle is first arrested in diastole, but afterward the condition of contraction is found similar to that noticed in cold-blooded animals. If given internally, larger doses than those above mentioned are required to produce the same symptoms. In dogs and cats nausea and depres-

sion are first produced; saliva flows from the mouth, and vomiting and purging occur; dyspnœa sets in, the heart's action ceases suddenly, and death takes place without convulsions. The heart is in the condition previously described. The blood is not affected. Dogs cannot be poisoned by the internal administration of sulphite of sodium, unless the œsophagus be tied after the introduction of the drug into the stomach. Large doses cause salivation, vomiting, restlessness, and sometimes dyspnœa. Recovery is rapid. In warm-blooded animals the toxic action is chiefly due to the influence of the drug on the respiration and circulation, and Pfeiffer gives details of experiments which seem to show that sulphite of sodium causes first central and then peripheral paralysis of the vessels, finally paralysis of the heart. The respiration ceases when peripheral paralysis sets in, but recovery can take place as long as paralysis of the heart is not yet present. Such recovery is often remarkably rapid, even in the deepest condition of poisoning, and is probably due to the rapid oxidation of the sulphite. Pfeiffer concludes from his experiments that the sulphite exerts a distinctly poisonous action on both cold- and warm-blooded animals, but they are so rapidly changed into sulphates that, unless very large doses be given, a sufficient amount of unchanged salts is not present to produce a poisonous effect. He finds that 96.5 per cent. of sulphite of sodium given appears in the urine as sulphate. When large quantities are administered, 85.8 per cent. passes out in five hours, the maximum excretion of both sulphate and sulphite taking place in the second and third hour, but more sulphite being excreted in the third hour. By the fourth hour all the sulphite has been converted into sulphate. The digestive disturbance which has been found by some to follow the medicinal use of the sulphites is probably due to the sulphurous acid freed by the acid of the stomach. In man, small quantities in the air breathed (under 5 per 1000) cause spasm of the glottis and cough, and prolonged respiration of air containing a very small proportion of the gas will at times give rise to chronic catarrh and inflammation of the respiratory organs. Pfeiffer concludes by pointing out that sulphites are sometimes added to wine in such quantity as to be capable of producing injurious results. Kammerer, in 80 specimens of wine examined, found 16 in which sulphites (from .0017 to .0093 per cent.) had been added. List detected sulphites in a large number of French

wines, the amount varying from .0009 to .0135 per cent. Since .08 gramme ($1\frac{1}{2}$ grains) of SO_2 , even when much diluted, will cause irritation of the digestive organs, the presence of sulphites in wine may be injurious if it contain a greater quantity than .08 gramme ($1\frac{1}{2}$ grains) in the litre. The addition of wine to conserves may also be productive of unpleasant effects on the digestion.

Temperature, Effect of, on Intestines.—Bokai²²,₁₄ contributes some interesting experiments on the effects of reduction of temperature on the bowel. In his operations on rabbits he exposed the bowel and reduced the temperature of the body from 36° to $27\frac{1}{2}^\circ$ C. (96.8° to 81.5° F.), and observed that the animals' intestines in this subnormal temperature remained quiet, motionless, and contracted. By touching the bowel with a potash salt it was observed that the points of contact caused the bowel to contract in circular rings,—a proof that the muscular tissue was not paralyzed, and that the immobility is not to be sought for in that direction. Again, if the bowel be touched with a sodium salt, the contraction in the length of the bowel was not observed in accordance with Nothnagel's theory; neither could the movement in the bowel be produced by irritating the peripheral end of the vagus nerve. This proves that in such animals the peripheral nerve-apparatus is paralyzed by the reduction in the temperature of the bowel, but the experiments did not prove that the peristaltic action was paralyzed in the nerve-centre. Martin and myself,¹⁰¹³ in a series of experiments made on the intestine in a normal state, could not confirm Nothnagel's theory, and I do not believe that its failure in Bokai's experiments proves anything.

The Influence of the Russian Bath on the Absorption and Elimination of Drugs.—A very interesting series of studies has been carried out during the past year by a number of investigators, chiefly in Russia, on this important subject. We wish that a similar series could be carried out upon the effects of this treatment upon the elimination of effete matters in cases of disease.

Faddeeff⁵⁸⁸,₁₅ has considered the assimilation and elimination of phosphorus, sulphur, and chlorine, and used in his work 7 healthy men of 21 to 44 years. Each experiment lasted ten days, divided into two equal periods of time. During one of the periods an ordinary Russian steam-bath (including sojourn on the "sweating-bench," at the temperature of from 42° to 68° C.— 107.6° to

154° F.) was taken once daily, about one and a half or two hours before dinner. The dietary consisted of white bread, butchers' meat, new milk, tea, sugar, and chloride of sodium. Not only the subject's urine and faeces, but also the food ingested, were analyzed. The amount of chlorides in the sweat was determined by calculation based on Favre's figures. The results may be given as follows:—

1. Under the influence of the Russian bath the metamorphosis of sulphur almost invariably increases, and that quite considerably. (In 1 of the 7 persons the metabolism fell 0.98 per cent., but in the other 6 it rose from 5.55 to 33.88 per cent.) The phenomenon is easily explained by the fact that the bath gives rise to an intensified disintegration of proteids. 2. The metabolism of phosphorus is also, as a rule, augmented, but to a lesser degree, comparatively with sulphur. (In one of the patients the metabolism of P_2O_5 decreased 5.41 per cent.; in the remainder it increased from 3.22 to 26.37 per cent.). The explanation is obviously the same as in the case of sulphur. 3. The metabolism of chloride ($NaCl$) usually falls. (In 2 cases it was increased from 3.94 to 5.18 per cent.; in 5 it was lowered from 7.75 to 37.69 per cent.) The cause of this phenomenon remains obscure. 4. The assimilation of all the three elements, on the whole, increases, the increase being most marked in the case of phosphorus and least pronounced in that of chlorine. (The assimilation of P_2O_5 in 1 patient decreased 7.08 per cent., while in 5 it rose from 1.45 to 5.24 per cent., averaging over 3 per cent. The assimilation of SO_3 in 3 cases fell from 0.34 to 7.6 per cent., and in the other 3 rose from 0.12 to 3.71 per cent. The assimilation of $NaCl$ in 2 persons fell 0.01 and 0.64 per cent., while in 4 it increased from 0.49 to 1.41 per cent.). 5. On the whole, the Russian bath intensifies metabolic processes in the organism, which are dependent upon an artificial heating of the body. The heating promotes cellular chemical processes, and brings about certain alterations in cells, with a persisting tendency to increased disintegration of cellular substance. Moreover, the bath produces a favorable influence on the assimilation of all mineral substances. The amelioration in the mineral assimilation is determined mainly by an increased absorption of fluids from the bowels into an inspissated blood.

Using practically identical methods, Sasonow⁵⁸⁶ has studied the

processes of absorption of iodide of potassium and salicylic acid. He finds that when 60 centigrammes ($9\frac{1}{2}$ grains) of the iodide are given in 30 grammes (7 drachms 43 minims) of water, the Russian bath causes a delay in the appearance of the drug in the saliva for six hours and in the urine for seven hours. The same results were also obtained (see Golberg's research in last year's ANNUAL) with salicylic acid.

Grusdew,^{588 25} has examined into the conditions of calcium, magnesium, potassium, sodium, and iron. The experiments were conducted on 8 healthy men (including the author himself), aged from 21 to 44. Each observation lasted ten days, during five of which a Russian bath of one hour's duration was taken once daily. The diet consisted of bread, butchers' meat, milk, and tea with sugar. The following are the main deductions drawn: 1. The Russian bath invariably increases the assimilation of calcium, magnesium, sodium, and iron, but depresses that of potassium. 2. It manifests a diametrically opposite influence on the metabolism of the metals; that is, it decreases the metamorphosis of calcium, magnesium, sodium, and iron, but markedly augments that of potassium. 3. In other words, the bath promotes the retention of calcium, magnesium, sodium, and iron within the system, while it expels potassium from the organism. 4. In view of the facts, Russian baths may find a useful application in the treatment of the so-called "mineral starvation."

All these studies were made in Manassein's clinic, and not only these but many others during the past few years show that this investigator is doing much to improve Russian medicine.

Closely allied to the experiments just detailed are those of Zawadzki,^{588 109} carried out in Tchudnowski's clinic concerning the effects of warm baths at 28° R. (95° F.), and of one-half hour duration, upon the assimilation and metabolism of nitrogen, one or two being given each day. The cases used were healthy young men of 21 years, and the results are interestingly similar to those of Aristoff published in last year's ANNUAL. Tepid baths invariably raise the nitrogenous metabolism, the average surplus amounting to 2.33 per cent. in persons taking one bath a day, and to 3.8 in those taking 2 baths daily. The increase remains more or less marked even for some time after discontinuing the bathing. For example, a subject who was taking baths for

three or four consecutive days: during the subsequent three or four days, the metabolism proves to be still increased as compared with the period preceding the bathing one, the average surplus being from 0.78 per cent. (in the case of one daily bath) to 2.47 per cent. (in that of two). The assimilation of proteids is augmented by tepid baths, the average rise being from 1.58 per cent. (one bath daily) to 1.6 per cent. (two baths). During the after-period (that is, after discontinuing the baths) the assimilation falls from 0.18 per cent. (one bath) to 0.78 per cent. (two baths), as compared with the time before the bathing period. The body's weight invariably increases. The same may be said in regard to the loss of water through the skin and lungs, as well as to the daily quantity of urea excreted in the urine. Similar studies have been made by Netchaïeff⁵⁸⁶,²⁵ which are identical in results with those just quoted, and, as two separate investigators agree, some reliance may be placed on their conclusions.

The results of all these studies upon warm or Russian bathing point, therefore, to the truth of the belief held by most practitioners of medicine, namely, that in these therapeutic measures we have a method by which we can stimulate the rapidity of tissue changes and at the same time increase the activity of the skin and kidneys in the elimination of urea and other effete materials.

Kravkoff⁵⁸⁶,²⁵ has studied the effects of warm baths on the assimilation of fats, using for his experiments healthy young men. The baths lasted half an hour. The dietary consisted of milk, best butter, fatless meat, bread, salted cucumbers, tea with sugar, and drinking water. The proportion of fats (fatty acids) in stools was determined after P. A. Latchinoff's method. The research has proved that: 1. The baths invariably improve the assimilation of fats, the surplus oscillating between 0.555 and 1.049 per cent. (For instance, the subject was assimilating 94.972 per cent. of fats ingested; in the bath-period, 95.975; and in the after-period, 96.021.) 2. They distinctly increase the bodily weight, the total gain (as measured in the after-period) varying from 424 to 1782 grammes (13 ounces 5 drachms 3 grains to 57 ounces 2 drachms 32 grains).

The same researches have been carried out by Shlitchevski,⁵⁸⁶,²⁵ who reaches conclusions directly opposed to those of Kravkoff; for he asserts: 1. That the assimilation of fats is in-

riably depressed, the decrease varying from 0.662 to 3.624 per cent. of ingested fats, and persisting during the after-bath period. (In 3 out of 5 cases the assimilation was even diminished still further after discontinuing the baths.) 2. The amount of voided urine decreases from 3 to 12 per cent., the diminution exactly corresponding to an increase in the cutaneous and pulmonary aqueous losses and lasting during the after-period. (In 1 case, however, in which the aqueous losses decreased after the cessation of the baths, the secretion of the urine became proportionately more abundant.) 3. The body's weight mostly (3 cases) slightly sinks, but sometimes (2 cases) somewhat increases. In the after-bath period, in 3 cases, it increased from 100 to 150 grammes (3 ounces 1 drachm 43 grains to 4 ounces 6 drachms 35 grains), in comparison with the first day of the experiment; while in the other 2 it decreased 87.5 grammes (2 ounces 6 drachms 31 grains) and 555 grammes (17 ounces 6 drachms 44 grains). The reasons for this curious discrepancy in results are difficult to discover, the only difference in two series of experiments lying apparently in the use of saline baths in the last experiment quoted, while in the first fresh water was used. It would seem probable that the effects of the bath in either case are so slight that the very minute variations which occur are really due to natural causes rather than to the baths themselves. Kravkoff's gains in assimilation and weight and Shlitchevski's losses are so small as to be almost valueless as results. Probably Statzkevitch,⁹⁰ who used cold douches, and found that the majority of cases assimilated more fats, while the minority assimilated less, is nearer the truth than either of the others, and he very sensibly concludes that the effects of the douches depend upon the individual peculiarities of the patient.

Gordon Dill², has studied the effects of bathing upon normal bodily temperature in the following manner: He took his temperature in the mouth before rising, and again after shaving, and then after immersion in a hot bath, followed by a cold plunge-bath. His morning temperature varied from 92.2° to 97.9° F. (33.5° to 36.6° C.); but after the hot bath (temperature 104° to 106° F.—40° to 41.1° C.) the temperature rose very considerably, in one experiment to 103° F. (39.5° C.), and after the cold bath it remained at 98.6° F. (37° C.). When, however, a cold bath was

taken without a previous hot bath, the temperature went down to 95.9° F. (35.3° C.), and remained low for some considerable time. Dill considers the depression felt to be due to this cause, and advises a hot bath before a cold one for persons in whom a cold bath brings no reaction.

Beljakowski,^{538, 26} ~~538, 26~~ has employed hot sand-baths to determine the physiological effects of heat applied locally in this form. The subjects were healthy young men, whose arms or legs were encased in a practically air-tight box well filled with hot sand at the temperature of 55° C. (131° F.), while that of the room was at 18.6° to 21.6° C. (65° to 71° F.). The experiments lasted one hour, and the following results were obtained: 1. Under the influence of local heat the general bodily temperature (40 experiments) always somewhat sinks. In the case of the upper extremity the axillary temperature falls, on an average, about 0.13° C. (0.23° F.) by the end of the bath, and 0.24° C. (0.43° F.) after the latter, the corresponding figures for the rectal temperature being 0.23° and 0.31° C. (0.41° and 0.56° F.). In the case of the hip-bath the respective figures for the axillary temperature are 0.06° and 0.32° C. (0.11° and 0.58° F.), and for the rectal 0.21° and 0.25° C. (0.38° and 0.45° F.). 2. But the cutaneous temperature of the limb experimented upon (64 experiments) as constantly markedly rises, the average surplus amounts to 0.73° C. (1.30° F.) in the cubital fossa, 0.79° C. (1.42° F.) about the middle of the forearm, 1.20° C. (2.16° F.) in the popliteal fossa, and 0.98° C. (1.76° F.) about the middle of the leg. The measurements were taken immediately after the bath. 3. The frequency of the pulse (40 observations) is always somewhat augmented. (In the case of the arm-bath, the average increase amounts to 6.85 beats by the end of the first half-hour, and 5.60 of the second, the respective figures for the hip-bath being 5.65 and 5.40.) After the bath, however, the pulse is retarded, becoming even less frequent than before the use of the heat. (The average decrease is 3.1 beats in manual cases and 2.7 in pedal ones.)

The Effect of Oil and Other Substances on the Secretion of Bile.—Rosenberg,⁵³⁹ by means of establishing biliary fistulæ in healthy dogs, has been able to somewhat extend our knowledge of the effects of different foods and drugs on the secretion of bile. It was found that, toward the end of the three months during

which the experiments continued, the quantity of bile diminished, but its consistency increased, probably through a deficiency of water. When the animals were kept without food, it was found that the flow of bile increased and decreased at the same periods of the day that it did when they were fed in the ordinary way. During the first hour of digestion the quantity increased, attaining its maximum during the second hour, after which it rapidly decreased, the consistence increasing as the quantity decreased. When fatty or oily substances were ingested, a stimulating action on the secretion was produced, a larger quantity of bile being secreted than when albuminoids or carbohydrates were taken, even large quantities of these substances producing far less bile than much smaller quantities of oil and fat. Indeed, these latter bodies possess a higher power of stimulating the secretion of bile than any other food or drugs, with the single exception of ox-gall, which, when taken by the mouth, increases both the quantity and the consistence of the bile excreted. Salicylate of sodium increases the quantity and diminishes the consistence of the bile. The action of Durand's remedy, turpentine and ether, was found to be entirely due to the turpentine, which has a slight stimulating power for the bile-secreting function of the liver. Carlsbad salts were tried both in gelatin capsules and in solution ; their effect was to decrease the quantity and to increase the consistence.

Physiological Action of Digestive Ferments.—Hildebrandt,²⁰ employed pepsin, rennet ferment, invertin, diastase, emulsin, and myosin by injecting them into the blood, and found that all of them produced fever, the rennet ferment being the weakest. The rise of temperature, he thinks, is due to increased heat production and decreased dissipation.

The Influence of Drugs on Absorption in the Intestines.—Closely allied to the paper of Küvshinsky, quoted in last year's ANNUAL, is that of Leubuscher, of Jena, read at the Ninth Congress of Internal Medicine, last May, in Vienna. This research was based on the variations thought to occur in the absorption of food-stuffs after the ingestion of certain drugs ; for it was very correctly argued that the cells engaged in absorption may be depressed or stimulated to less or greater activity by poisons with which they may come in contact. The first series of experiments seem to us of little real value, except to show what we already

know, namely, that powerful irritants may so alter the tissues as to cause complete loss of function. They consisted in isolating a coil of intestine and injecting into this closed sac a strong solution of one of the mineral acids, which was then washed out with water and replaced by a solution of grape-sugar. It was found that the absorption of the glucose was much slower under these conditions than in the healthy intestine. Another series of experiments consisted in the production of congestion or anæmia in a loop of intestine, and studying the rapidity of absorption in the presence of these two opposite states. As would be supposed, absorption was interfered with in both instances, but the greatest interference was in the congested segment of intestine, which is natural, in view of the function of the veins leaving the intestinal walls. So far as the effects of drugs were concerned, it was found that quinine, morphine, or opium all seriously inhibited the absorption of iodide of potassium and grape-sugar; while alcohol, in from 2- to 5-per-cent. solutions, and weaker solutions of common salt, greatly increased absorption. Glycerin and Carlsbad water had no effect. In another series of experiments, iodide of potassium was given by the mouth with water, alcohol, glycerin, Carlsbad water, and milk, and the urine carefully examined for the iodine. When alcohol was used absorption was most rapid, and when glycerin or water was employed it was slow but equal in each case, although Carlsbad water increased it. Milk diminished the rapidity of absorption of the iodide. The experiments of Blumenau seem to contradict this, for he found that alcohol slowed the absorption of iodide of potassium, and that the stronger the solution the more rapid the process. Of this last conclusion we doubt the correctness.

Effects of Certain Substances on the Red Corpuscles.—Mayet, of Lyons,⁶ read an interesting paper at the recent meeting of the French Association for the Advancement of Science, in which he gave an account of the effects of various neutral salts and of chloral on the red corpuscles of the blood. Solutions of the strength of 1 to 2 per cent. of chloride of sodium, chloride of potassium, sulphate of sodium, phosphate of sodium, bicarbonate of sodium, and sulphate of magnesia all at first temporarily destroy the elasticity of the corpuscles, and then dissolve or disintegrate the stroma. Solutions of the strength of 5 per cent. or more diminish

the size of the corpuscles and harden them. The chloride of sodium has the most preservative primary action, but is most destructive on prolonged contact. As is well known, it has been recommended for washing the blood (in a 0.6-per-cent. solution) in certain cases of poisoning. Sulphate of sodium has a great tendency to preserve the chemical properties of the corpuscles, but makes them much more rigid than does chloride of sodium. It is not suited for intra-venous injections, but is very useful in the laboratory for washing the corpuscles before preparing haemoglobin from them. For this purpose it is better than 3-per-cent. solution of chloride of sodium, which is commonly employed, but which has a considerable tendency to dissolve the corpuscles. Chloride of potassium has a great preservative action, but cannot be used for intra-venous injections owing to its toxicity. Carbonate of sodium, in weak solution, is very preservative. Phosphate of sodium, in weak solutions, renders the corpuscles rigid for a long time; it preserves their form well, and so is useful in diluting the blood for the purpose of counting the corpuscles. Sulphate of magnesium does not dissolve them, but changes their shape more than any of the other salts. Hydrate of chloral is very destructive to the corpuscles when it is in a concentrated solution, but not when it is of less strength than 5 per cent. Intra-venous injections of the latter, which may be repeated several times daily, are very valuable in tetanus, in uræmic convulsions, to calm the violent spasmodic attacks in rabies, and in some painful diseases where hypodermic injections of morphine are inefficacious or badly borne. Of course, the effects on the heart, respiration, and urine must be carefully watched.

ELECTRO-THERAPEUTICS.

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Neuroses.—Acting upon Engelskjön's theory, the fundamental expression of which is that there exists a direct antagonism between the actions of the faradic and galvanic currents upon the circulating innervation, the former dilating the contracted vessels, the latter contracting those which are actively dilated, E. Perregeaux, of Montreux,²¹⁴ reports the successful use of electricity in certain cases of "neurasthenia," whose symptoms were persistent feeling of oppression of the head, depressed spirits, impaired memory, and in many of which there was a cerebral hyperæmia, associated with a disturbed equilibrium in the circulatory innervation and a feeling of great anxiety. One difficulty was in the choice of the current to be used, and yet he was able to decide correctly in 3 reported cases where he followed Engelskjön's rule: "Cases of neuroses which are produced by depression of spirits, fear, sorrow, affliction, and the like are best treated with the faradic current (to this class belong also cases of tobacco poisoning and neuroses due to frost). On the other hand, however, cases which are called forth by overwork, either of the brain or muscular system, or by enforced wakefulness, demand the galvanic treatment." Only weak currents are used (never over 2 milliamperes); one pole is placed over the nape of the neck, and the other over the larynx underneath the chin.

CATAPHORESIS.

Ehrmann,²¹⁵ in order to show how substances enter the system by cataphoresis, devised the following: Two similar glass vessels, with zinc-plate electrodes in the bottom, were filled with a moderately weak watery solution of methyl-blue; into each of them

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the experimenter placed one of his hands, when a continuous current of 10 to 20 millampères was turned on. In from five to ten minutes the hand which was in the vessel connected with the anode became studded with blue points, while the other hand was not affected. These points were mostly seen on the dorsum of the hand, round about the fine hair-follicles and sebaceous glands; they were not present in the palms or around the edges of the nails; where the hairs were coarse, the coloring was much less. The entrance of the dissolved coloring matter took place in the mouths of the follicles which were not surrounded to any great extent by horny cells. In a case of sycosis after epilation he attained a satisfactory result by the use of sublimate on the anode.

By means of a specially-devised bath for cataphoresis, by Gaertner,⁸⁴ either half of the surface of the body can be brought under the influence of the active pole by simply attaching the positive pole to the upper or lower cells. The current is diffused quite evenly over the whole body, and its intensity may be gradually increased to a considerable degree without causing any pain. Sublimate was used for experimentation; in the lower positive cells 60 grains (4 grammes) were dissolved; *séance* lasted fifteen minutes; strength of current, 100 millampères. In twenty-four hours urine contained mercury; on the fourth day this amounted to 0.7 gramme (11 grains). In 2 test cases of men who were attendants in a bath,—in 1 case 100 millampères were passed fifteen minutes through a bath containing 60 grains (4 grammes) of sublimate in the positive cells, in the other case the sublimate bath was given without any electricization. In the former, in the first twenty-four hours, 0.3 milligramme ($\frac{1}{20}$ grain) of mercury was found in the urine, in the latter none. No more quicksilver was detected in the urine of either men; it is supposed that the urine in the first case became so quickly free of mercury because the man's work caused such free diaphoresis. The third experiment was made on himself; the bath contained 90 grains (6 grammes) of sublimate, and 100 millampères were used for twenty minutes; on the fourth day his urine contained 1.3 milligrammes ($\frac{1}{8}$ grain) of mercury; after the eighth day his urine was free; from which observations he concludes that: 1. The mercury passed directly through the skin. 2. The absorption, being equally distributed

over the whole surface of the skin, may possibly be of advantage in securing a local action upon the germs which are found in the diseased epithelial structures. 3. The amount of mercury absorbed depends upon well-known physical conditions, and is proportionate to the strength of the current and its duration; what influence the degree of concentration of the water used in the bath has upon the absorption is not quite so clear. 4. The method is clean and painless, and, according to the writer's experience, devoid of danger.

Arthur Harries,²² says, in reference to cataphoresis: "From a fair number of observations with *several* drugs, I have arrived at the conclusion that electrodes of suitable metal (the positive being of a size corresponding to the area which it is desired to bring under the influence of the drug), padded with several layers of *flannel*, are best for working purposes. It is not necessary that the solution of the drug should be used at both poles, for reasons which I will adduce; but it is *absolutely necessary* that the solution in question should saturate not the negative pole as stated, but the **POSITIVE** pole. The reasons for this are (*a*) the direction of mechanical transference of fluid by cataphoresis is *always that of the current*, viz., from positive to negative; (*b*) repeated experiments with a 10-per-cent. solution of hydrochlorate of cocaine have distinctly shown that the region covered by the negative electrode, so far from being anæsthetized by the solution (when that also was saturated as recommended in the report), was actually rendered hyperæsthetic, while the area covered by the positive electrode became insensitive to the passage and action of a needle used to electrolyze hair." He also found a current strength of 10 to 15 milliampères, applied for thirty minutes by means of the pads described above, quite sufficient to pass iodide of potassium into the kidneys in quantity large enough to give distinct chemical tests in the urine.

Experiments made by Sulla in connection with Matteini²³ prove that when the positive pole is attached to the chloroform-saturated electrode no cataphoresis takes place; this occurs when the negative pole is connected with the chloroform electrode. In both, however, there is a local anæsthetic action which acts favorably on neuralgia. Which is the most preferable, future experiments must decide. W. H. Walling¹⁸⁸ reports successful results from cataphoresis in neuralgia, the positive pole being saturated

with chloroform, and in 2 cases of herpes where a solution of corrosive sublimate (1 to 1000) was applied by the positive pole. He has also used tincture of aconite, cocaine, morphine, and hyoscine in the same manner with good effect. In making these applications he uses his carbon electrodes, covered with absorbent cotton, the latter being well wetted with the solution.

THE GENERAL THERAPEUTICS OF ELECTRICITY.

A. D. Rockwell remarks⁹¹⁴ that few who are now using electricity in the treatment of disease stop to consider the effects of the passage of currents through living tissues or upon what is based the *rationale* of every electro-therapeutic result. The literature on this subject has accumulated beyond measure, but still shows so little correct appreciation of its physics that it is necessary to emphasize the statement again and again that electricity is not a simple, single manifestation of natural force, but that it is a generic term, which includes complex phenomena with wide variations and manifestations. Electricity is a stimulant of the most powerful character, and an irritant when this side of its nature is sought for. As a sedative, in some cases it is unequaled. Admitting the recognized significance of the word tonic, and that remedies for improving the tone of the system still hold an important place in the classification of the *materia medica*, it is my opinion that electricity should be classed as a tonic of very high order. It possesses varied influences of this kind, according to the kind of current used and the method of its application. To produce that tension of the nervous system and of the muscular fibre generally, so as to enable them to respond to their natural stimuli, the mechanical effects of the faradic current seem to be speedily applicable. This is a current of alternation, with a to-and-fro motion, dependent on the closing and breaking of the current. Unlike the galvanic current, it possesses no chemical action which need be feared, and no powerful reflex effects need render one unduly cautious in its use. In the passage through the body of a current interrupted with the requisite degree of rapidity, it need produce no appreciable muscular contractions, yet it gives passive exercise to all the deeper layers as well as to the superficial muscles. Aside from the purely mechanical effects of the induced or faradic current, there seems to be a more subtle

influence upon the nerves themselves. No purely mechanical influence can produce the numerous phenomena that follow its use in some diseased conditions. In the tedious period of convalescence from the protracted fevers, electricity in some of its forms has done good service. It gives passive exercise to the muscles; it promotes and renders more natural the processes of secretion and excretion; it corrects circulatory disturbances, and gives tone and strength to both nerve and muscle. Those who fail to get good results in the use of electricity are either deficient in experience, or not sufficiently persistent, or somehow fail in the technique of application.

A distinction has been made, and justly, between electrolysis and galvano-chemical cauterization. The former is a disintegrator and separator of the constituent elements of organized structures. The latter produces its effects by means of the acids and alkalies that are liberated at either end of the pole by electrolytic action. It is the chemical galvano-cauterization, and not the electrolysis, that accomplishes most of the good results that follow intra-uterine applications in cases of endometritis. The action of either current modifies the physiological functions in various ways. It has been readily demonstrated how the secretion of salivary glands may be increased. Mucous secretions are very quickly increased by either current. In my own experience, the electrical treatment has sharpened the appetite, quickened digestion, and relieved constipation so rapidly and decidedly as to make it evident that the gastric and intestinal juices are all made to secrete more liberally, and that the action of the current is on the nerves that supply these organs rather than on the tissues of the organs themselves. Among the affections of the bowels where electricity is quite certain to exercise a beneficial effect are those of defective innervation; also those diseases comprehended under the names of hypochondriasis and neurasthenia. Its influence over the circulation, on the arteries, veins, and capillaries, is due to its power to increase the quantity and quality of innervation received by them.

Disorders of the Cerebro-Spinal System.—Morton Prince,⁸⁹ after a consideration of electricity as a means of diagnostinating paralysis due to disease and that which is feigned, and its applicability in different forms of muscular atrophy, reviews his own ten years' experience in hospitals, with a view to establishing the true

position of electricity in medicine. He is convinced that *electricity, properly used, is a valuable agent, but that it has been misused and abused*, and its merits both extravagantly extolled and depreciated. In neuralgias its action is both palliative and curative: it may relieve the pains at once, but they frequently return at varying intervals, and the too sanguine physician is apt to forget this. He reports one bad case of tic douloureux completely cured. This case is all the more striking because tic douloureux is not, as a rule, amenable to electrical treatment. In acute or subacute neuritis, whether the inflammation be in a motor, sensory, or mixed nerve, he is unable to indorse the opinions of those who regard electricity as having a curative power. Whatever effect is produced is, in the great majority of cases, palliative, and consists in temporary relief of pain,—a relief that is often grateful.

The atrophy of paralysis following infantile paralysis, joint-lesion, and disuse are benefited by electricity, and the two last may be said to be cured. Other adjuvant treatment, however, should not be neglected.

In spite of the fact that the lesion of *cerebral hemiplegia (haemorrhage)* is in the brain, the effect of electrical stimulation of the muscles is beneficial. *Diphtheritic and pressure paralysis* improve more rapidly under this treatment than without it, the latter especially. One can observe an increase in power almost day by day. He knows of nothing more satisfactory than the treatment of hysterical affections by electricity, although he believes —a point he later reverts to—that the effect is to be ascribed to suggestion rather than to the physical agent. In muscular rheumatism he regards its influence as more palliative than curative. In chronic articular rheumatism he has never been able to satisfy himself that the swelling and thickening of the tissues are reduced, but considers its use advisable in certain cases. Painful neuroses, as a class, are amenable to electricity. Some cases are cured, others relieved, and others are not benefited at all. In no sense is electricity a cure for true neurasthenia; it often acts as an excellent tonic, relieves nervousness and dispels insomnia. Many of the pains and uncomfortable feelings which are ordinarily classified under the heading of psychoses and neuroses can be relieved, especially by the static variety of electricity.

Electricity is not of the slightest use in curing such diseases

as locomotor ataxia, disseminated sclerosis, progressive muscular atrophy of the spinal type, myelitis, or general paralysis. There is not the slightest evidence that electricity applied to the spine affects the cord favorably in such diseases, or, indeed, that it affects it directly at all. It may, as a counter-irritant, relieve temporarily some of the discomforts; but the same results can be obtained in other ways, as, for example, by blisters and dry cups. Nor is it of any more use to attempt to restore muscles irretrievably wasted and paralyzed as the result of old nerve injuries and idiopathic neuritis of long standing. When the wasting and paralysis are moderate, and where there is reason to believe that the nerve itself has become in a fair measure regenerated, we may be able to improve the condition of the muscles; but unless the functions of the nerve and spinal centres have been in part restored, all attempts to reclaim the muscles will be hopeless. Electrolysis has been successfully used by him in the removal of hair from the face, of vascular tumors of the skin, and warts. Port-wine stains were greatly improved, and the dilated veins which often, in advancing years, deform the face were satisfactorily cured.

Galvanization of the Brain.—Gessler, of Stuttgart,¹²³ endeavors to pass the current through the brain in such a manner as to avoid sending a strong current directly through the diseased part, and thereby saving the patient from the disagreeable consequences which otherwise follow. The *séances* last from one to two minutes, and the current should not exceed 1 milliampère; the electrodes consist of light, easily-bent material, 16 centimetres long and 6 centimetres wide, which are applied over the forehead and to the nape of the neck. The whole brain is affected by the current, a portion of which passes through the diseased structure. He reports the following successful case: Policeman, who, after suffering from two attacks of left hemiplegia, the result of a blow on the head on two occasions, was left with ataxic aphasia and suffered from severe headache, cardiac pains, and faintness. Face livid; eyes prominent, pupils uneven. Slight trace of paralysis on left side of face. Could only make himself understood by his daughter's assistance. Diagnosis: apoplexia cerebri dextra, without much destruction of brain-tissue. First application, anode to forehead, cathode over neck, 1 milliampère, one and one-half minutes; then cathode before the ear, anode to neck, current

slowly increased to 3 milliampères; *séance* four minutes, repeated three times each week. After the second sitting facial expression completely changed; pupils alike, eye-balls no longer bulging; speech somewhat improved. After six more the patient could readily make himself understood, and at the end of June he was discharged cured.

Amenorrhœa.—Besides general treatment, H. N. Hinton¹⁴⁷ makes use of the percutaneous electrical application, viz., spinal and combined spinal and abdominal applications of the galvanic current. In the former, the anode ($3\frac{1}{2}$ by $2\frac{1}{2}$) is held immovably over the lumbar region, while stable application of the cathode is made over cervical and dorsal regions for the space of one minute, the dose being 10 to 15 milliampères; in the latter, the anode applied as before, and the cathode over each ovarian region, for 15 to 30 milliampères. In cases of retarded development the faradic current is used, the anode over the back and the hypogastric region; the cathode, a well-insulated uterine sound, is introduced into the uterus. The duration of *séance* is five to ten minutes, dose 5 to 25 milliampères. In some cases Apostoli's bipolar electrode is best used when an electrolytic action on the mucous membrane is sought for. In the majority of cases the ovaries must be included in the treatment by a cup-shape electrode to cervix (cathode), while the anode is placed over each ovarian region; the dose is 10 to 60 milliampères for three minutes every third day.

Constipation.—John V. Shoemaker,¹²¹ while using the galvanic current in the treatment of prostatitis, discovered its beneficial effect in constipation. The rheophore, representing the negative pole, is introduced into the rectum; the other is placed on the perineum. Strength of current should be about 1 millampère, rather less than more; the slowness of the increase, as well as its steadiness, seems to be a factor in the success of the result sought for. The action appears to be due to an increased secretion and a dilatation of the lower portion of the bowels.

Observations showed that anode closure dilates and cathode closure contracts a mucous-membrane channel, hence the intra-rectal electrode must always be the negative. He adds that the current from the contact of the positive pole is injurious to mucous-membrane passages, and near the prostate may seriously injure the constitution of that delicate gland.

During a period of five and a half months in the clinic of Prof. Slavjausky,²³ there were treated 20 cases of fibro-myoma, 22 of metritis and endometritis, and 70 of disease of the uterine appendages, including the broad ligaments; also 3 of amenorrhœa and 1 of hystero-epilepsy. In 34 cases a cure was obtained, in 8 there was no perceptible change, and in 3 there was deterioration. The following conclusions are submitted: 1. Apostoli's method merits the attention of gynæcologists. 2. It is one of the bases of conservative gynæcology, and has an assured future. 3. It is still in its initial and experimental period. 4. It relieves the pain and haemorrhage of fibroid tumors, and restores the normal function of the uterus. Under its influence tumors become movable as the inflammatory matter is absorbed, and, finally, there is reduction in the size of the growth. 5. Its results in haemorrhagic endometritis are satisfactory, and it is to be preferred to curetting. 6. It should be given a fair trial before castration is determined upon.

Vaginismus.—Lomer, of Hamburg³¹⁷, reports 2 cases of vaginismus completely cured, the cathode being applied over the abdomen, the anode to the perineum. Both remained free from the trouble for six months, and coitus, formerly impossible, was easily indulged in.

Trachoma.—Adler³⁴ reports a case of trachoma of three years' standing completely cured by the galvano-caustic treatment. At the end of a year there were no signs of recurrence.

Cystic Goitre.—E. Fletcher Ingals, of Chicago,⁶¹, after having failed with other methods, introduced one needle into the sac and, placing the opposite pole over the tumor, passed through it for about ten minutes a current from 6 to 10 Leclanché cells; the *séance* was repeated four times, when the sac did not refill. Three years after, the parts were in the same condition. In a second case he introduced two platinum needles into the cyst (which had been previously tapped) 1½" apart; passed a current from four diamond carbon cells through it for twenty minutes; four *séances* in one month resulted in a cure.

Syphilitic Sclerosis.—Clemens's "imbibition fluid," for use in the electrical treatment of syphilitic sclerosis, is made in the following manner¹¹⁶: Dissolve thoroughly 36 grammes (1 ounce 2½ drachms) of ordinary cooking-salt in 1000 grammes (34 ounces)

of soft water; after twenty-four hours add 12 grammes ($3\frac{1}{2}$ drachms) of sodium bicarbonate. puriss. pulverat. This solution must be shaken every hour; then, if it is clear, 15 drops of the officinal tincture of iodine are added. The whole is to be shaken several times each day, and, if it is perfectly colorless at the end of fourteen days, it is ready for use.

Insulated metal cylinders, with a small glass tube in the end, for the purpose of supplying the fluid to keep the linen compresses continually wet, are placed over the penis, which is first covered with linen compresses moistened in this solution. In bad cases applications are made four times a day, one pole to the back of the neck and the other to the metal cylinder; a weak faradic current is then passed for from twenty to twenty-five minutes, just enough for the patient to feel it; moistened compresses, covered with gutta-percha tissue, are then bandaged over the sclerosed area. These *séances* are continued three or four times daily until the sclerotic spots are completely covered over with epidermis, after which direct applications are made to the diseased tissue by means of a bulbous electrode placed upon a few thicknesses of moistened linen over the affected area, the other pole being attached over the neck. The current must be even weaker than in the indirect application, and should never be so strong that the patient feels the vibrations at the site of the trouble, especially as sclerotic tissue is very insensitive. The duration of *séance* should be ten to twenty minutes. Too strong a current sets up an inflammation in the indurated and surrounding tissue. Applications to the indurated inguinal glands are made in the same manner with a bulbous electrode; afterward, the penis alone is kept wet with moistened compresses.

A third *séance* is then given, like the first or indirect method, except that a metal cylinder is used, around which is wound a carefully insulated spiral of wire; by this means the penis is acted upon through the moistened compresses by an induced current. On account of the increased resistance of the spiral, a stronger faradic current must be used. In this manner three or four *séances* daily will result in a cure in six to seven weeks; sometimes no improvement is shown at all for the first two weeks, and the writer cautions against using too strong a current under such circumstances, since it will only act as an irritant. "Imbibition and

molecular oscillation" are the two chief factors in this electrical cure of sclerosis.

Fibroids.—H. T. Rutherford²⁸ summarizes the results in 14 cases of uterine fibromata treated by electricity: "A. In 1 case the tumor entirely disappeared, though not in a manner I should have chosen. B. In 4 cases urgent symptoms were relieved and the tumors decreased in size. C. In 3 cases temporary amelioration was noted. D. In 2 cases no effect whatever was noted, either upon the symptoms or size of tumor. E. Three cases discontinued attending after a short course of treatment. F. In 1 case the treatment had to be abandoned owing to certain circumstances (much burning pain, shocks). It is impossible to state the result as 'cured' and 'relieved.' A better classification, if such it can be called, is (1) favorable, (2) uncertain, (3) unfavorable; and the results then are as follow: favorable, 5; uncertain, 6; unfavorable, 3, cases under C and E being classed as uncertain."

He limits the method of treatment to cases (1) in which the symptoms are severe and call for active interference; (2) in which the tumor is not too nodulated; (3) in which the tumor is not subperitoneal; (4) in which the tumor is not of the soft, œdematous variety; (5) in which the patient bears the treatment well.

The consensus of opinion in regard to the treatment of fibroids by electricity at the Medical Congress of Australasia¹⁰⁰⁰ was unfavorable to such procedures. J. Foreman in 10 cases was extremely disappointed in the results, and Rowan's experience in 15 was very unsatisfactory. In 1 case of enlarged, firmly bound-down, tender ovaries, in 1 of solid pelvic tumor, and a third of greatly inflamed, matted-together tubes, Foreman perfected a cure of the disease and the symptoms, especially the pain, which had persisted for nearly a year. Puncture was resorted to and a positive current of 150 millampères given for ten minutes. Batchelor had in three months reduced to below the umbilicus a tumor originally extended to the ribs.

A very valuable paper, by reason of the careful division of the cases, the conciseness of the reports, and the unbiased opinion of the writer, is that of John W. Taylor, of England,¹⁵ whose domain is chiefly surgery. It is devoted largely to a consideration of the electrical treatment of myomata, and hence is introduced under that heading. The number of cases is 31 and divided as follows:—

Dysmenorrhœa (with infantile uterus),	3
Chronic ovaritis and inflammatory disease,	8
Prolapse,	4
Syphilitic stricture of rectum,	1
Subperitoneal thickening,	1
Uterine retroflexion with menorrhagia,	5
Myoma,	<u>10</u>
	31

In the 2 cases of simple dysmenorrhœa, where there was no existing lesion further than an infantile uterus, electricity failed and cure resulted from operative interference.

In 8 cases of chronic ovaritis, with symptoms of continuous pain, dyspareunia, and sickness, 4 have been distinctly benefited, 1 lost sight of, and 3 were unaffected by the treatment; 1 of the last had had the appendages removed some years ago without relief, and abdominal section was done on another, appendages removed, and the retroflexed uterus attached to abdominal wall. In 1 the ovarian nausea was completely checked by galvanism of the pneumogastric.

"In uterine prolapse galvanism probably ranks with support and massage as a useful adjunct to operative repair, and as such I occasionally order its application by one of my nurses, without taking special notes of the cases so treated."

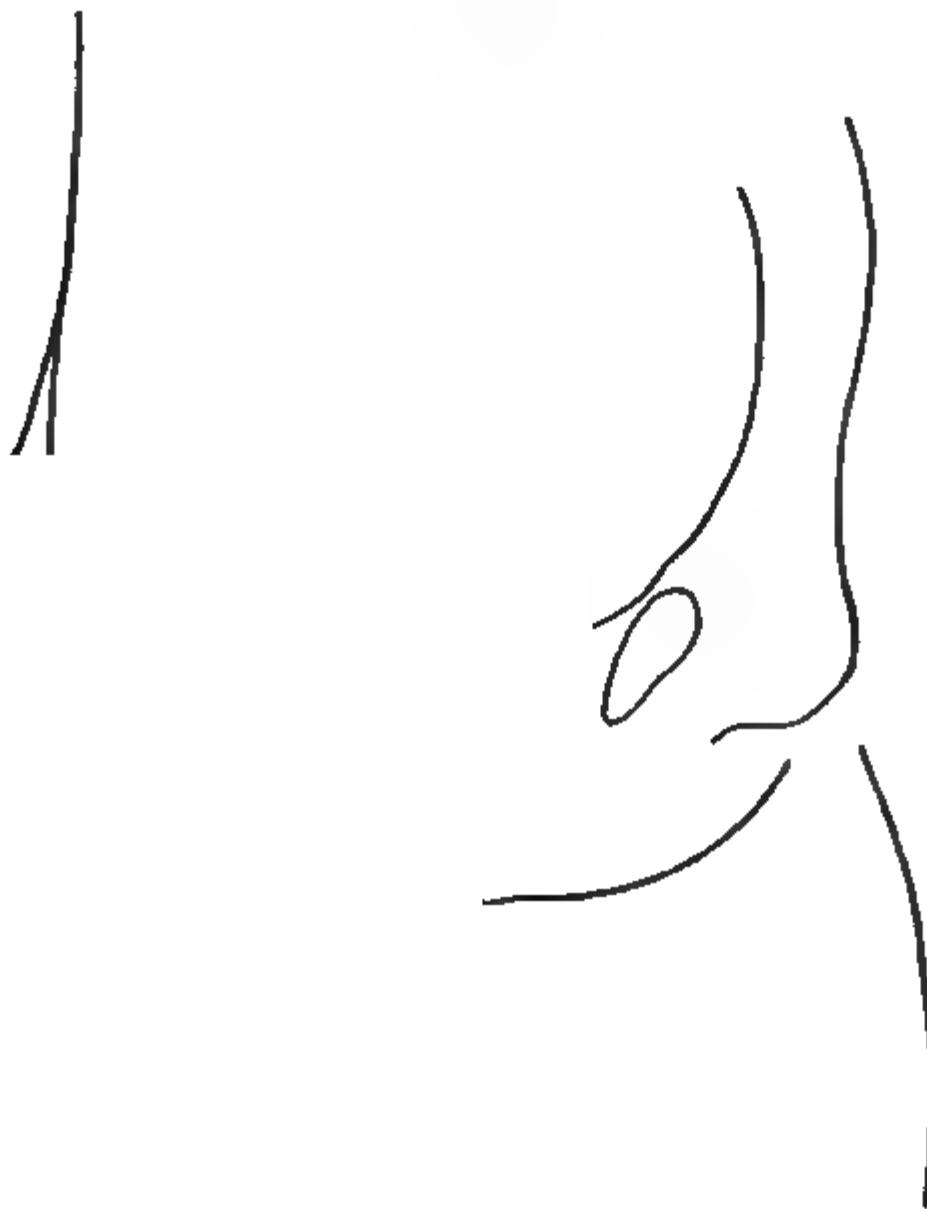
The case of stricture of the rectum was a fatal one. Newmann's method was used, and the patient had four sittings and died in a typhoid or septic state six or seven days after the last, an erysipelatous condition of the vulva being the first symptom. Such results occur after simple dilatation, and the propriety of performing a colotomy should be considered before attacking severe rectal disease *in loco*.

In the case of subperitoneal thickening galvano-puncture caused considerable absorption and abatement of the pain which had been constant in the left side of the pelvis and down the left leg for seven or eight years.

Of the 5 cases of retroflexion, in 4 of which the metrorrhagia was very severe, the positive intra-uterine electrode was used. In one pain, the prominent symptom, was increased after two applications; so Alexander's operation was done; it is too early, as yet, to report the result. In the other 4, with retroflexed, enlarged, and flabby uteri, independent of subinvolution, galvanism undoubtedly aroused healthy muscular contraction. The uterus became

smaller, its walls firmer, and when replaced it retained its position. Each patient wears a pessary and has been free from any excessive haemorrhage for more than a year.

The 10 cases of *myoma* which he reports form the most important and interesting group of the series. Of these, 3 were absolutely cured, 2 were symptomatically cured, 3 were greatly



MYOMA OF POSTERIOR WALL OF UTERUS.
(Practitioner.)

relieved, 1 was unaffected by the treatment, and 1 temporarily injured. The three recoveries are reported separately:—

“ 1. Mrs. S., aged 46, widow, for one and a half years had been suffering from menorrhagia with clots and great pain. Menstruation lasted seven days, the interval not being longer than two weeks. During the interval she complained of discharge, with pruritus and some dysuria. On examination the uterus was found generally large and flexed, with a definite myoma to be felt in the

posterior wall. (See cut.) Positive intra-uterine galvanism was commenced in September, 1887, and continued until the following March. Galvanism was used in preference to removal of the appendages in this case mainly because of the patient's age. Twenty-eight applications in all were made, the strength of the current usually being about 200 milliamperes. By the end of this time the patient was menstruating regularly, without pain or excessive loss; the uterus had diminished in size to the normal, and by the aid of a pessary was kept in position. When last examined, no tumor whatever could be felt. The pruritus and discharge disappeared soon after the beginning of the course. The pruritus in this case appeared to be directly cured by the galvanism, as no other treatment was adopted.

"2. Mrs. L., aged 35, was sent to me by Dr. Wilson, complaining of a constant watery discharge from the womb and bearing-down in this situation. On examination, a substance like a fibroid polypus or ovum was found presenting just within the external os, but the latter was not sufficiently dilated to make the diagnosis certain. A few days later the cervix was dilated and an examination made under anaesthesia, when it was found that the dilatation had had the effect of causing the temporary disappearance of the tumor. This appeared to be a small intra-mural fibroid, and the dilator had pushed it toward the peritoneal surface. After removal of the dilator the tumor soon re-assumed its first position, and could be distinctly felt as a small, hard, intra-mural fibroid, occupying the substance of one side of the uterine cervix. This appeared to be a very good test case for galvanic treatment, and it was decided to use positive applications in the usual way, and, if these failed, galvano-puncture. Intra-uterine galvanism with the positive electrode was accordingly applied about once a week, from August 29, 1888, until the end of December, in all about eleven times.

"By the end of November the myoma had disappeared, and the electrode, which at first had to be carefully guided over its convexity, passed straight to the fundus without difficulty. No puncture had been necessary. Three months later I again examined the patient, when the following note was made: 'The uterus feels absolutely normal. The patient has been quite free lately from all bearing-down and discharge.'"

The third case is remarkable both for its complications and for its unexpectedly successful character:—

"3. Miss G., aged 45, came to me first for a large tumor of the breast. She had also a rather prominent central abdominal tumor, and was blanched with haemorrhage. I found, too, that she had old cardiac disease, which I believed to be aortic-obstructive in character. I removed the breast on August 27, 1889, and had to be very rapid in performing the operation, as she did not take the anaesthetic well. The wound healed by first intention, and I then turned my attention to the abdominal tumor. I found a large, central, symmetrical myoma, mainly of the body of the uterus, the cervix being free. The sound passed directly upward for $3\frac{1}{2}$ inches. On bimanual examination the tumor felt about the size of a four-months' pregnancy. For three years the patient had been suffering from acute menorrhagia. On account of her heart disease and my previous experience with the patient under anaesthesia, I advised galvanism rather than the removal of the appendages. Only six sittings were given, the applications being positive as regards the uterus. Each sitting was followed by unusual distress and pain, although the strength of the current was never greater than 170 milliampères, and often considerably less. At the third sitting it was noticed that the myoma was much lower in the pelvis, the os being close to the vulva, and strong bearing-down or expulsive pains were excited by the passage of the current. At the end of November the patient ceased to attend, although she was much better, and the haemorrhage had been checked by the treatment.

"A week ago I sent for her, and found that the myoma was practically non-existent. She had improved greatly in color and strength, and, as happens in the greater number of cases treated by this method, the uterine canal was so contracted that a sound could not be passed. The uterus, however, could be distinctly palpated by bimanual examination, and was only very slightly larger than normal."

Of the 2 "symptomatically cured," in one menstruation became regular and normal in quantity, and the patient regained much of her former health and strength, after twenty-five sittings (galvanism, intra-uterine, positive). In the other the writer had done abdominal section some years previous, but was only able to

remove one tube and ovary; after twenty-nine sittings the patient had been free from any excessive haemorrhage for a year.

Of the 3 greatly relieved, the growth of the tumor appeared to be checked by the use of galvanism in 2; in 1 of these negative puncture was resorted to; in the third, the haemorrhage was checked, patient's health much improved, and her nervous symptoms quieted; progress, however, was slow, and he removed the tubes successfully.

The case "unaffected by treatment" was complicated by Bright's disease, and had only five sittings. She died (being too ill to attend regularly) from uræmia.

The last one, "temporarily injured," had a large, rapidly-growing myoma, for which the tubes and ovaries were removed. Haemorrhage and the growth of the tumor persisted afterward; so galvano-puncture was resorted to, six months later, at two sittings, with the result of producing a sloughing condition of the tumor. This was removed *per vaginam*, and the patient made a good recovery.

In conclusion, Taylor states: "Galvanism in gynaecological practice should not be applied by an electrician, but by a surgeon.

"In whatever form employed, electricity evidently has most power in disease of muscular structures. In myoma, uterine atony, and, possibly, in some chronic forms of tubal disease, the well-known power it possesses of causing healthy and energetic contraction of muscle-fibre appears to me to be one of the main causes, if not the chief, of its beneficial action.

"Four facts which I have noticed during the treatment of myomata by this method seem to point to muscular contraction as an important means by which a recovery is effected:—

"1. At the close of the sitting the electrode may often be felt to be firmly grasped by the uterus. 2. In a case which is proceeding well, I have remarked that the whole tumor settles down in the pelvis, the patient complaining of expulsive pain. 3. In some cases of the harder variety of fibroid I have watched the pedunculation occur during treatment, and in an old case attending Dr. Apostoli's clinic this process, affecting a large number of fibroids, had reached a point which I have failed to observe in any case untreated by galvanism. 4. At the close of a course of this treat-

ment the whole uterine canal becomes usually so contracted that it is impossible to pass a sound. The bearing of this observation may need some explanation, as the positive intra-uterine electrode has a cauterizing action which some might consider quite sufficient to account for subsequent contraction. The infrequency, however, of a similar result when other and even stronger cauterizing methods have been employed, suggests that close apposition of the cauterized surfaces must be maintained in order to produce the conditions described."

Gautier,³⁴ reports 67 cases of uterine fibromata, on which he made 1329 applications; 62 of them he saw later, and they were cured. Four bad results are noted, and there was 1 fatal case (through unaccountable changes in the adnexa). He uses from 30 to 250 milliampères, and considers 120 or 140 milliampères a moderate dose. In cases of bleeding, the positive pole only should be inserted in the uterus.

Myomata.—Ephraim Cutter,²⁷ in a paper read before the International Congress, at Berlin, gives the results of nineteen years' experience in electrolysis of myomata; his first case was treated on August 21, 1871; after two *séances* the patient refused further treatment. He uses the constant current, large plates, and seeks for quantity, not intensity, of the current.

In regard to the action of the current he says: "We do not know all about the currents of electricity that are flowing through the human body, and when I insert my needles into a tumor, and they are connected with my battery, I expect that the current will flow through the tough tissues of that tumor and influence the heart,—in fact, the nerve-centres themselves; for in them it is my belief that the therapeutical action is done. We influence the processes of nutrition so that the tumor is eventually absorbed by nature's own methods."

A *résumé* of his cases, 50 in number, is as follows: non-arrests, 7; deaths, 4; arrests, 25; relieved, 3; absolute cures,—that is, disappearance of tumors,—11. It is only just to say that the 4 deaths were as follow: 1. A case that would have operation, despite her condition; death from asthenic type of typhoid fever. 2. Death from entirely unnecessary exposure in a cold room. 3. Death from typhoid fever after third operation; did not have treatment. 4. In a morphine-eater, after second operation.

Besides the expected arrest of development in a large part of the cases there have been realized : " 1. In some, entire cure. 2. In some, great diminution of the growths. 3. Relief from pain and haemorrhages in the large majority of cases. 4. Attention to the operation by eminent members of the medical profession. 5. Counting in all the reported cases, there must have been over 400 cases of applications of galvanism to uterine fibroids, while the unreported cases probably increase this number by scores. 6. Another realization has been the variations from galvanism to faradism, in the mode of application, in the batteries, in the duration of applications, the number of applications, the kind of electrodes used, and the discovery of instruments to measure the current by milliamperes. 7. The operation has been widely published and has become pretty well known. 8. The time seems to have come when uterine fibroids are no longer ' opprobria medicorum.' These results promise better things for the future, when our knowledge shall be more perfect and complete."

Franklin Townsend ²⁷ reports his experience and deductions as follows :—

"Seventeen cases in all were treated,—4 for intra-mural fibroids of uterus of large size, accompanied by excessive haemorrhage; 7 had simple catarrhal salpingitis, with dislocated and inflamed ovaries attached by perimetrical adhesions, with uterus in retroflexion or version; 2 had subinvolution of uterus in retroversion with metritis, though the organ was mobile in both cases; 1 had a simple multilocular ovarian cyst; another was suffering from pyosalpinx. The remaining cases, 2 in number, were of the type of women suffering from the result of exudations following abortion, where all the pelvic organs seemed matted together. The result of my experience with electricity, as used in the cases mentioned, may be briefly summarized as follows: 1. I was much disappointed in the results derived from this mode of treatment. 2. That the treatment, to my mind at least, was carried out in the most 'approved' manner. 3. That many of the patients objected to its use because of the pain it caused them, though the strength of the current was comparatively mild. 4. Some objected to its use absolutely, because of its causing pain and making them worse. 5. That in two instances where 120 milliamperes were used, local erosions of the mucous membrane resulted. 6. That the time and

number of 'sittings' in each individual case seemed sufficient to prove or disprove its value as a curative agent. 7. That only a few cases were benefited by its use, notably the fibroid cases, in which the haemorrhage seemed to be controlled. 8. That these tumors were not diminished in their size by its use. 9. That pelvic exudations were not absorbed or even aided in that process by its use. 10. That the necessity of frequency of its application sadly wearies patients. 11. That the loss of time to the practitioner is not inconsiderable. 12. That the use of this method of treatment is by no means always unattended by danger to life. 13. That the claim or desire on the part of the patient, after a long and fruitless trial by this method of treatment, for operative measures, if thought feasible, should command attention on the part of the practitioner. 14. That, altogether, I must confess to disappointment in this method of treatment in all the cases cited, and until I find something better, though still desiring to be conservative, I shall go back to my operative surgical work, in which, as a rule, success and permanent cure has obtained." In the discussion, Baldy, Joseph Hoffman, Werder, Ross (of Toronto), and Shoemaker coincided with the deductions arrived at by Townsend.

Engelman,²⁵ says, in reference to the polar action of the galvanic current, that the chemical action of the poles is the factor which, besides and with the interpolar action, comes chiefly into consideration in employment of the constant current in gynaecology.

According to the observations of Ciniselli and Tripier, which are entirely approved of by Apostoli, the *positive* pole acts *coagulatingly* and gives a hard, dry scab, which heals with a retractile scar. The *negative* pole causes a soft, non-retractile scar, hyperæmia, and haemorrhage. Shaw,¹⁰⁴³ experimented on recently-moved fibroids, through which the current was passed and the tissues afterward examined microscopically, and found that, as regards the interpolar action, the *positive* pole confines itself more to the *cells*; that of the *negative* pole to the *formed elements*. Upon the base of his experiments he comes to the conclusion that the *constant* current acts in a threefold manner: 1. Through direct *electrolytic* change of the substances, especially of the liquids and fats. 2. The *negative* pole acts as a strong *revulsive*, the *positive* as a *styptic*; the latter acts not only through the fact that it causes coagulation, but also by narrowing the lumen of the blood-vessels.

3. Through *elevation of the tension of the blood-vessels* and change in the nutrition and fluid contents of the tissues.

In reviewing the works of Apostoli, and from personal observations made at his clinic, he comes to the conclusion that Apostoli's procedure consists in: 1. The introduction of *platinum sounds* as electrodes into the uterus. 2. Placing of a large electrode of *moist clay* upon the abdominal walls. 3. The application of *accurately measured* and constant currents of the strength of 60 to 70 milliampères, for five to fifteen minutes. If the uterine cavity is not accessible, then the electrode is introduced into the uterine tissue by means of an *acupuncture* needle, or a new passage into the uterine cavity is produced by the aid of a *dagger-like* pointed sound. As contra-indications to the application of the strong currents, Apostoli considers only certain forms of hysteria, acute perimetritis, and intestinal catarrh (*entérite glaireuse*).

The new and essential points in it are embraced in: 1. In the application of currents of *such great strength* as were formerly not even approximately used; 2. In the *measuring* of the current by means of an accurate galvanometer, whilst before it was measured by the number of the elements, which is a very inaccurate method, as it is exceedingly subject to changes according to the size of the latter, degree of freshness, system, etc. 3. In the introduction of one pole into the uterine cavity, or even into the tissue of the uterus, and by this increasing its action.

The electrodes are of the utmost importance; for the external, Apostoli clay electrode is the best, and is made of fine potters' clay enveloped in broad-meshed muslin or gauze, the upper surface of which is brought in contact with a small metal plate. Fine steel needles are used in acupuncture, and plastic carbon intra-uterine electrodes of different thicknesses, 3 to 4 centimetres long, for intra-uterine application. Saline solutions must not be used on the clay, since it is decomposed by the current and destroys the skin; all abrasions must be carefully covered with some protective. Thorough antiseptic is a *sine qua non* of the operation.

At the first application not more than 50 to 70 milliampères should be used by a slow state of progression from 0; subsequently the current may be increased to 100, 150, and 200 milliampères; applications to be made twice a week.

Electro-puncture needs far greater prophylaxis, as stronger

reaction follows more easily. After careful disinfection of the vagina, scorching of the instruments, etc., the sound, provided with the needle, after the insulating tube has been fixed at the selected place, is introduced through the tissue into the desired depth. The latter amounts rarely to more than 1 centimetre. Deep puncture, as he formerly made it, Apostoli rejects as unnecessary and dangerous. Many bad results are due to deep puncture.

As a therapeutic agent G. Engelman knows of no better remedy than the faradic current in ovarian neuralgia; sometimes it acts magically. Apostoli also warmly recommends the weak (10 to 20 milliampères) galvanic currents in ovarian neuroses; intra-uterine, by means of the bipolar sound, for the faradic current; for the galvanic, the negative pole, intra-uterine. The same opinion is held by Grandin, Hunter, Pierce, and Freeman. In pruritus, Engelman and F. Martin have had excellent results (4 to 6 milliampères).

In dysmenorrhœa favorable results are reported by Moebius, Mann, and Bayer, while Lee, Morrin, Nielsen, and Freeman are much in favor of it. Playfair (100 milliampères, negative intra-uterine electrode) cured in three applications 2 cases which had resisted all other treatment for a long time.

In amenorrhœa I have tested it in an extensive manner, and reject its use in anaemia of a high degree, as the use of the galvanic current aggravates. I would rather recommend faradization, although galvanization yielded good results in plethoric persons. In defects of development and superinvolution Engelman also advises faradization, negative electrode, intra-uterine. It has been successfully applied in stenosis of the cervical canal, in chronic metritis and subinvolution, and in endometritis. In chronic inflammatory processes of the appendages and in peri- and para-metritis the future must prove its efficacy.

In the treatment of myomata it has a bright future. Cutter, apparently the first to employ it for myomata, has had many followers, among whom may be mentioned Brown, Kimball, G. Thomas, Semeleider, Omboni, Everett, Braschet, Martin, Chéron, Leblond, and Zweifel.

To Apostoli belongs the credit of establishing on a thoroughly scientific basis the methods of procedure. At the Dublin Congress he offered the following conclusions:—

"The influence of the treatment showed itself in a diminution in the size of the tumor, and appeared after several *séances*, lasting after the termination of the treatment and reducing the tumor by one-fifth to one-half of the original size. With the diminution in size the tumor becomes more movable; the symptoms of pressure, reflex neuroses, etc., as well as the hæmorrhages, disappear in 95 per cent. of the cases. The majority of the women who went through the treatment felt themselves entirely cured, even if the tumor was still present. Only in a few cases were the results incomplete."

Lately, Apostoli has had no disagreeable phenomena, in spite of the fact that his patients belong to the poorest classes, who, after the operation, have to walk quite far, and afterward cannot take care of themselves at home. His results are due, probably, to the thorough antisepsis. Playfair speaks quite favorably of the method, as does Sir Spencer Wells, who examined 60 patients of Apostoli. Routh, W. Duncan, Steavenson, give a similar opinion. Lawson Tait, who was at first very much opposed to it, withdrew his statements after the publication of Thomas Keith, saying: "In the presence of such evidence it becomes our duty to test this method, no matter what difficulties should offer themselves." Very enthusiastic advocates are found in Sir Spencer Wells and Thomas Keith. The latter has tried electricity 1200 times in more than 100 patients. He says: "Many who came to me in order to be operated went home with the tumor much diminished in size, normal menstruation, freed from their difficulties, and able to enjoy their lives again. I never was in favor of hysterectomy, but to-day I feel strongly that I should think myself guilty of a criminal act if I should recommend to a patient to risk her life without having given a thorough trial to electric treatment."

Engelman gives an extensive statistical table of the treatment, course, and results of case treated by Apostoli's method, showing that all observers, even those not favorably inclined, have found that the influence of electricity upon hæmorrhages is, with the exception of a very few cases, an exceedingly favorable one.

Further, the general state of the patient seems to be improved (in all cases), even before any essential improvement is noticed in the hæmorrhages, pains, etc. Almost as constantly as the hæmorrhages, the pains as well as the feeling of pressure are favorably

influenced. The latter is very probably dependent upon the diminution in the size of the tumor. The tumor remains and only becomes smaller, but the patients regard themselves as cured, which they are in fact, as the symptoms have disappeared and the result of the treatment is lasting. Unfavorable results are not lacking, such as rise of temperature, pain, and parametric inflammation, especially where electro-puncture is used. To avoid this, superficial punctures only should be resorted to (1 to 2 centimetres deep). Above all, it must be again and again emphasized that strict antisepsis is the indispensable condition of the procedure. In most of the unfavorable results it (antisepsis) was incompletely, or not at all, carried out. The results attainable by the use of remedies which are at present at our command are not such that we should not be happy to possess an additional remedy, which especially acts more rapidly than all others against the most alarming phenomena —the haemorrhages.

It is, therefore, the duty to try thoroughly Apostoli's procedure, especially in uterine myomata.

The Edison Current Adapted to General Office Use.—Henry G. Piffard has described¹, a device whereby the Edison, or any similar incandescent-light current, can be used for ordinary electrical applications. He claims that there is a difference in the effect of the current of given strength, when the pressure, or tension, varies. As the tension of the street current (120 volts) is higher than desirable for many purposes, and especially in electrolysis, he has adapted an ingenious method of shunting the same through lamps of varying resistance, in such a way that the voltage may be reduced from 120 to 60, 40, 30, or any other desired voltage. In combination with this, he uses, of course, a rheostat and a milliammeter.

The efforts of P. Bröse² to prove the practicability of using electricity generated by a dynamo-machine met with such success that he presented to the Berlin Medical Society a masterly paper describing the whole apparatus and showing the superior advantages of the same, both as regards its adaptability and cost. By a system of insulated wire resistance coils, a current of 100 volts from the street wire can be reduced to a maximum of 20 milliamperes, 50 milliamperes, 100 milliamperes, 200 milliamperes, and 300 milliamperes, respectively. This current is conveyed thence to

a table on which are the galvanometer, rheostat, induction apparatus, and the various keys for making and breaking the currents, etc., just as when it is generated by elements. The physiological and chemical actions were precisely the same.

With the faradic current the tension or pressure of the galvanic current (100 volts) was so great in comparison to that generated by one to two elements, that the induced current was stronger, and 2 ampères were sufficient to burn out the platinum contact points.

In its use for galvano-caustic work, care must also be observed not to destroy or oxidize the platinum points by using too strong a stream, since here the galvano-caustic wires offer little resistance to the current. The constant current alone was used, and the writer considered a current of 100 to 150 volts absolutely free of danger. No more than 300 volts from the constant current should ever be carried into a dwelling-house, or 200 from the alternating.

A. D. Rockwell considers the action of the faradic current on the smooth muscular fibres of the uterus, when applied therapeutically, to be analogous to that of ergot, although manifestly more prompt and energetic, especially under the influence of the positive pole, which possesses a far greater power over the involuntary muscles than the negative. By this action a veritable interstitial massage is obtained. It is potent in overcoming the primary inertia of the uterus, and in preventing an arrest of retrograde metamorphosis, through which came subinvolution and its inevitable and persistent *sequelæ*. In the more chronic diseases of the uterine parenchyma and its lining membrane, resource should be had to the electrolytic influence of the galvanic current. That the galvanic current often completely dissipates fibroid tumors of the uterus few will affirm. The symptoms can be relieved to a greater or less extent by electrolysis, and sometimes so completely relieved as to lead to the belief, so far as the patient is concerned, that the tumor has entirely disappeared. I am a firm believer in the great utility of the galvanic current in the absorption of the thickenings and infiltrations resulting from inflammation of the pelvic cellular tissue. The effect of either current in dissipating the uterine and ovarian pains is sometimes remarkable. I had a case in which the patient had suffered intensely from dysmenorrhœa for six or seven years, and had finally resorted to extirpation of the ovaries for the relief of it. The

flow had gradually diminished, but the pains had increased in severity. Under the internal applications of the galvanic current, ranging from 25 to 50 milliampères in strength, the paroxysms had yielded rapidly, and in a few months recovery was complete. If an agent like the galvanic current possesses such marked influence over so many forms of pain of obscure origin, why should not this treatment precede, rather than follow, severe operative procedures for their relief?

Stricture of the Rectum.—With an experience of 14 cases of stricture of the rectum treated by electrolysis, Robert Newman, of New York,⁹ found that the best results in the treatment of rectal strictures were obtained from the use of the same method as would be employed in the treatment of urethral strictures, except that a stronger current may be used and the sittings may be more frequent. While in the urethra 5 milliampères would be sufficient, 15 milliampères may be used in the rectum. The treatment may last fifteen or twenty minutes, and the sitting should be once in every four days.

Among the conclusions arrived at by the author are the following: Electrolysis in the treatment of strictures of the rectum is not a panacea; on the contrary, failures may happen, and probably ultimately will happen in the strictures due to carcinoma. Electrolysis will commonly cure rectal stricture when all other methods have failed. Electrolysis will cure a certain percentage of cases without relapse better than other modes of treatment, and without the necessity of after-treatment or the use of bougies. The best chances of cure are in cases of fibrous inflammatory stricture. The best method of treatment is with the metallic-bullet electrode as negative pole, a weak current, and treatment every four days.

Hypertrophic Callus after Fractures.—That hypertrophic callus following fractures may be successfully dissipated by the percutaneous use of the galvanic current the case of Moritz Meyer¹⁰ proves. Operative interference would probably have left the man with a crippled index finger and hand, whereas after sixteen *séances* the patient was able to move all three phalanges freely, although unable to close the hand quite as forcibly as before.

On tumors of not so hard a consistency, equally good results were attained.¹¹ Thus, in a man 79 years of age, with gouty

deposits along the sheaths of the extensor tendons of both hands, twenty-seven *séances* were sufficient for a cure, the anode being a large flat electrode bound around the arm, while the cathode (5 centimetres broad and 20 long) was wrapped around each wrist successively. Two cases of circumscribed tendo-synovitis, with hard bodies on the vola side of the metacarpo-phalangeal joints, were completely cured in twenty to twenty-five *séances*, respectively. The treatment was also effective in chronic exudation of the subcutaneous connective tissue, in 1 case due to prurigo of two years' standing, and another of facial herpes, also of two years' standing.

Rheumatic Facial Paralysis.—In cases of rheumatic facial paralysis, which Workman²¹⁸ divides into three forms, the patient is likely to recover in two to three weeks, when the reaction with the galvanic current on the paralyzed side is the same as on the healthy. In the second form, when, on applying the galvanic current with one pole over the affected muscle, a slowly advancing contraction takes place along the muscle, and this contraction takes places with a weaker current than the normal contraction on the healthy side, and the order of the reaction is reversed,—i.e., positive-closure contraction takes place with a weaker current than negative-closure contraction,—recovery may be expected in one to two months; some contraction may, however, remain. In the third form, when there is no reaction to either current over the nerve, and where the positive-closure contraction of the galvanic current occurs with a weaker current than the negative-closure current, the prognosis must be much more unfavorable.

ELECTROLYSIS.

S. Ehrmann, of Vienna,⁸⁴ in the treatment of warty growths of the male and female urethra and verrucous pigment-nævi of the face, uses a sharp-pointed steel needle for the cathode, which is inserted into the mass about to be removed, while the anode, a moist-sponge electrode, is placed indifferently over the body or held in the hand; where the warts are numerous, from three to six needles, attached to an electrode, are inserted at the same time. He avoids the use of lancet-shaped needles entirely, because they are more difficult to introduce and because of the greater destruction of tissue. The strength of the current is from 1 to 1½ millampères. He reports 33 cases,—6 of papilloma of the scalp, 8 of pointed condyloma of

the external genitals, 3 in the vagina, 2 each in the male and female urethra, 5 of warty pigment-nævi of the face, and 7 of warts of the hands. In some, other measures—as the use of dry salicylic-acid powder, resorcin-paste, and the curette—had been used without success. Now and then there was a recurrence of the papillomata, until he inserted the needle somewhat obliquely ; therefore, he says the needle must always be introduced in this manner under the skin into the base of the growth.

The advantages of electrolysis are : 1. The pain is very slight. 2. There is no hæmorrhage. 3. Thorough antisepsis is more easily attained, since there is no open wound (he has never had any suppuration). 4. One can destroy the mass, even its root, without producing a wound, whereby scars are avoided and recurrence prevented.

M. Vogel, of Eisleben,⁶⁰ in the treatment of teleangiectases, employs one electrode, which has both insulated poles joined together, and which consists of two or more fine steel needles, separated from each other by 1 millimetre. The advantage is that it leaves one hand of the operator free.

Deep scars result if the current is allowed to pass for too long a time through the same point ; hence, the needles should be re-inserted in fresh places. Applications should not be made oftener than every one or two weeks. When hæmorrhage occurs during the withdrawal, the current should be allowed to pass through the drops of blood, thereby producing coagulation.

Graefe follows Voltolini in having both poles terminate in needle-points, and not the cathode only. He has met with success in the use of electrolysis in verruca, in nævi pilosi et pigmentosi, and in small fibromata of the skin ; the last requires several sittings for a cure. He reports the case of a physician who, during a post-mortem, inoculated his index finger with tubercular disease, manifesting itself in the form of tubercular nodules ; these entirely disappeared by electrolysis, without any glandular infection taking place. No new nodules were apparent at the end of nine months. In cases of lupus there is a recurrence of the tubercular nodules, as in all other methods of treatment ; in the very recent cases, however, its action is quite satisfactory.

Stricture.—Fort¹⁸⁶ has performed linear electrolysis in 700 cases of stricture without a fatal result. He says the operation is

harmless, rapid, painless, and bloodless, and does not require a retained catheter. No serious accidents occur. In the first case, on which he operated in April, 1888, the cure has remained permanent, and no catheter has been used since. Fort has also had remarkable success in a case of œsophageal stricture, the patient, who was dying, being perfectly cured in one month. In fifteen séances she gained 25 pounds and could eat all manner of solid food. Fort concludes that linear electrolysis is applicable to all kinds of strictures, wherever situated; that, owing to its simplicity and harmlessness and absence of relapse, it should be preferred to urethrotomy and other methods; and that, combined with dilatation, it achieves excellent results in stricture of the œsophagus. It certainly benefits organic strictures and cures the fibrous and cicatricial forms at once, provided only that they will admit of the passage of a small bougie to act as a guide.

Solid Tissues—Goitre.—The destructive action of the two poles of the galvanic current in electrolysis on solid tissues was accurately observed by A. Kuttner, of Berlin, ¹⁸⁸⁸, in a careful series of experiments on the testicles of living dogs. The following were the results: The + pole as a means of causing absorption of the deeper structures is wholly unsuitable, as it produces too severe reaction, which persists a very long time, and the absorption takes place slowly. Much more effective is the negative pole; its destructive action is more intense, reaction less and subsiding more rapidly, and the absorption of the necrotic tissue is quicker. Two needles in the cathode give better results than one.

In 9 cases of goitre treated by electrolysis 2 were completely cured, 5 were greatly benefited, the circumference of the neck measuring fully 2 centimetres less, and 2 were lost sight of. The essentials for a proper application of the remedy are an accurate galvanometer, a rheostat, large flat electrode, and single and double, thoroughly insulated needle electrodes. The flat electrode-anode is placed over the breast and the negative needle stuck into one of the nodules of the tumor; a current of 60 to 70 millampères is slowly applied for ten to twelve minutes; the opening is sealed with iodoform collodium. Séance repeated in two to three days. After twenty to thirty sittings the treatment should be discontinued.

In 2 more cases, in which the pressure upon the larynx from

the goitre was quite severe and caused distressing symptoms, the treatment promised much, as the patients, who were still under treatment, appeared improved.

Electrolysis of the prostate through a carefully-insulated, needle-pointed, rectal electrode would be justifiable early in the disease; if very urgent symptoms were present, complete closure of the urethra might result from the superinduced swelling.

In naso-pharyngeal tumors the prognosis after surgical procedure is very bad; not less than 50 per cent. die or have a recurrence; whereas, according to Grönbeck, the results after electrolysis are much better. He tabulates 33 cases of naso-pharyngeal polypi which were completely cured, there being no signs of recurrence after six months. Of 17 cases, 13 improved and in 2 there was complete disappearance of the tumor, the question of recurrence being undecided in them; 2 cases were not influenced by the treatment and 1 case was fatal. Kuttner adds another successful case of fibro-sarcoma, in which the anode was applied over the breast; the cathode, an insulated, lancet-shaped, platinum electrode, was introduced into the tumor, both through the pharynx and the nose. The chief portion of the mass was destroyed in ten sittings and the small remaining parts in five more. The strength of the current used was as high as 92 milliampères. After seven months the naso-pharyngeal cavity remained perfectly free and the man had grown strong and hearty.

In 2 cases of excessive hypertrophy of the nasal mucous membrane, a cure was accomplished after four and six sittings, respectively, 20 to 25 milliampères and five minutes long. In hypertrophy of both tonsils, the left was cured after three and the right after five sittings. Epithelial warts disappeared and left scarcely any scar; 10 to 12 milliampères were used from four to five minutes. In stricture of urethra the writer believes that there would be a tendency to contraction of the circular scar, producing the same symptoms as the original disease.

ACCIDENTS FROM THE ELECTRIC CURRENT.

Philip Coombs Knapp, of Boston,⁹⁹ collected the reports of 32 deaths from lightning in ten years (1879 to 1888). No constant lesions were noted; punctate haemorrhages in various organs were common, and even meningeal and intra-meningeal haemorrhages of

considerable size (Stricker²⁰). In non-fatal cases the victim seldom sees the flash or hears the thunder. There is often a period of unconsciousness, after which there may be mental depression or excitement; the respiration is feeble, the pulse small and slow, the skin cool, and the muscular strength diminished; there may be suppression of urine, nausea, loss of appetite, or diarrhoea. The menses may be suppressed. Vision is often affected. In some cases there are various symptoms due to the haemorrhages or to inflammation of the internal organs, but the effect is not usually permanent (Sestier¹⁰⁰⁷).

The nervous symptoms are varied: anaesthesia; paresis in definite regions; pain in affected region; hemiplegia, due probably to an intra-cerebral lesion; hysteria; paralysis, usually of short duration, but which may be permanent. In some victims there exists afterward a peculiar susceptibility to thunder-storms and electricity.

The reported autopsies on patients killed by currents of high potentials are few. In such the blood is usually fluid; the viscera are congested; small haemorrhages of the serous membranes are frequent. Peterson¹⁰²⁸ thinks there are no pathognomonic signs of death by electricity, but that it divides and disarranges the fine molecular structure of the body.

Tatum¹ believes there is no lesion after death which can be ascribed to electricity; and its fatal action was found, by experiments on dogs, to be due to the arrest of the heart's action, this arrest being caused by the action on the heart itself. Death in some cases results from exhaustion due to the burns and sloughs. The cases which do not result fatally may be divided into two classes: I. Cases in which the electric current gives rise to no protracted symptoms, except burns and their consequences. II. Cases followed by more or less protracted symptoms, chiefly of a nervous character. This first class may be further subdivided into three classes: (a) Cases in which the electric current apparently produces no lasting symptoms of any kind. (b) Cases in which the electric current itself apparently produces no symptoms, but gives rise to a fall which may cause more or less severe symptoms. (c) Cases in which the electric current produces more or less severe burns, but apparently no other symptoms referable to electricity. Under category I he (Knapp) reports the case of an electrical

engineer who received a shock from a 1000-volt alternating current without injury.

According to Holman, of the Massachusetts Institute of Technology, the limit of the voltage which causes death apparently lies somewhere between 2000 and 500 volts; brief shocks from 1000 volts, alternating, are not fatal. We may, therefore, suppose the limit to range between 1000 and 2000 volts, either alternating or direct. Morton Prince thinks that the psychical shock of the electric current is productive of most of the symptoms, in the same manner as the psychical shock of railroad injuries causes many of the nervous symptoms.

As a result of experiments conducted in the British Institution of Electrical Engineers,⁶, it was found that the resistance which the human body, considered as a conductor, presents to the passage of an electric current is very much greater in the case of a single continuous current than in the case of a series of alternating currents; that the risk of shock is much more serious when an abundant store of electricity is drawn upon if the current be alternating than if it be continuous.

STATIC ELECTRICITY.

Andrew Graydon⁷⁰⁰ has deduced the following conclusions:

1. Static electricity is a safe and reliable agent in the general practice of medicine.
2. This treatment can be applied pleasantly and with benefit to patients, and at times when the galvanic and faradic cannot be used.
3. In "static insulation" we get results only attainable from "general galvanization" and "general faradization," without the expense of time, trouble, and exposure,—and frequently, too, after both these forms have failed.
4. In many forms of pain, prompt and permanent relief follows its application, such as is unequaled by other agents.
5. As a tonic in systems overwrought, overdrawn, mental grip slipping away, it performs a very important part. The readiness with which it can be applied and the good results obtainable prompt me to make use of its properties frequently.
6. In various forms of headaches its effects are uniformly good. It is a common remark to hear from patients, "I can feel the pain

being lifted, the heaviness going," or similar expressions, indicative of appreciable relief.

7. In the treatment of insomnia, the use of the douche is effective, a feeling of drowsiness making itself felt during its application.

8. In treatment about the head I have found a difference in the effect between the positive and negative poles, not elsewhere.

9. The benefit of the faradic current is obtained from the static induced.

10. Growth of hair, I have observed, has been promoted, and the falling out of it stopped, in some of my cases of head pain.

THE ACTION OF THE CONSTANT CURRENT ON MICRO-ORGANISMS.

In the year 1888, Apostoli and Laquerrière referred to the antiseptic action of the constant current. During the last two years they have conducted more careful investigations, with the following results,⁴ :—

If both poles of the constant current are introduced into a test-tube containing a "bacillary culture," vertically and 3 centimetres apart, and with the culture so treated inoculations are made on culture media and likewise on rabbits and guinea-pigs :—

1. The action of the constant galvanic current will be in direct proportion to its intensity.

2. The intensity, and not duration, of action (*cæteris paribus*) is of importance.

3. A current of 300 milliampères or more, of five minutes' duration, sterilizes cultures of anthrax bacilli, making subsequent inoculations innocuous.

4. A current of from 200 to 250 milliampères does not, with certainty, inhibit the virulence of the culture. A few guinea-pigs died after inoculation, although later than control animals inoculated with a culture not acted upon by electricity.

5. A current of 100 milliampères or less does not destroy the virulence of the culture even after thirty minute's duration ; only a diminution of the culture was noted, inoculated guinea-pigs dying one or two days later than control animals. They also determined that these results were independent of any thermic action accompanying the electrolysis.

Studying further the action of the individual poles, the following conclusions were attained:—

1. Even when thermal action was excluded, the virulence of bacteria is diminished or destroyed.
2. The *positive pole* alone is capable of action.
3. By the unipolar application a diminished intensity of the current is necessary; a current of 50 milliampères suffices to diminish and of 100 to 150 milliampères destroys the virulence of the microbes.
4. With the "medicinal" current doses of from 50 to 300 milliampères no specific influence on the cultures is secured, but is due more to the development of acids and oxygen at the positive pole.

L. Prochownick and F. Späth, of Hamburg,¹¹³ in testing the action of the positive pole on the *staphylococcus pyogenes aureus*, the *anthrax bacillus*, and the *streptococcus pyogenes*, found that it possessed in a high degree a local antiseptic action, destroying the vitality of the cocci; the *anthrax bacillus* required the strongest current, the *staphylococcus* next, and the *streptococcus* the weakest. Its action was probably due to the chlorine set free from the NaCl solution used as a medium. These experimental results may be made use of in treating gonorrhœa of the urethra and the cervix, since the coccus can be destroyed in each case without the introduction of an instrument, causing an extension of the disease. Further, it would be indicated in certain forms of endocervicitis and endometritis. Four cases are given in which—after, respectively, six, eight, nine, and seven *séances*, of 80 to 100 milliampères—the disease was cured.

INSTRUMENTS.

S. Ehrmann, of Vienna,¹¹³ describes an electrolysis needle which he uses for condylomata situated deep in the vagina and the male urethra, used in conjunction with the speculum or endoscope. It consists of a needle insulated by a thin rubber covering, with a curved hard-rubber handle, which is provided with a screw attachment for the conducting wire. The conical point, 5 millimetres long, is attached at an angle of 160° to the long axis of the instrument, thereby allowing one to pierce the base of the growth obliquely, even deep in the urethra. The perineal electrode devised by Stembo can be applied from the front or the back, and,

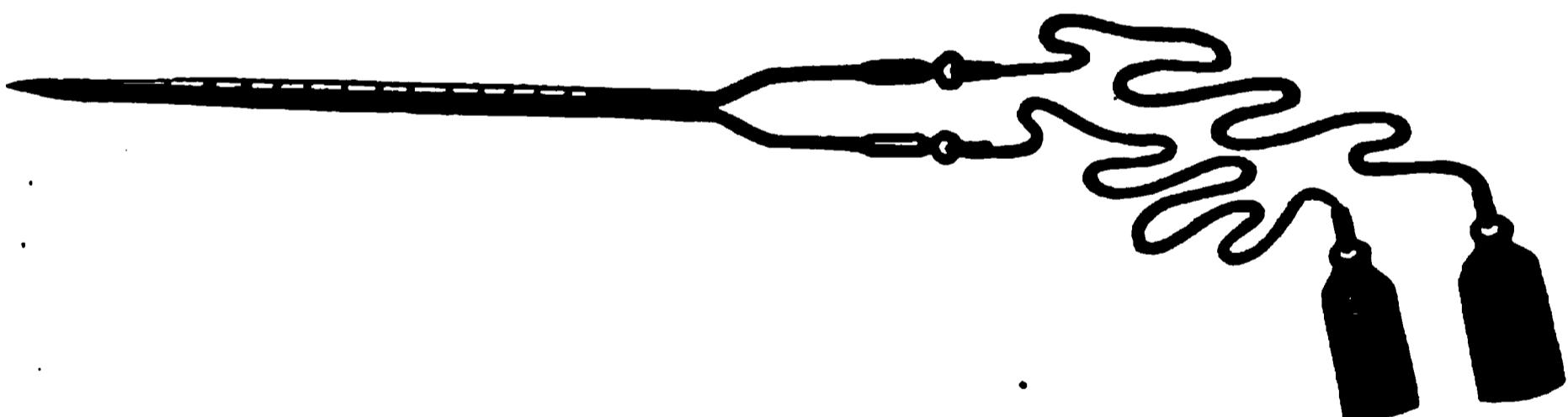
by changing the angle of attachment of the spad to the shaft, even pressure on the perineum may easily be attained.

The electric-bullet probe of R. L. Watkins, depicted here, is an improvement on a former one in that it can be rendered thoroughly aseptic. It consists of two semi-cylindrical pieces of steel or copper wire insulated from each other by about $\frac{1}{16}$ inch. One end terminates in two prongs, to which the wires or electrodes from



ELECTRODE FOR PERINEUM.
(*Berlin. klin. Woch.*)

the mouth-battery are attached, the other in a point. The battery consists of two pieces of different metals which are placed in the mouth, one on either side of the teeth next to the cheek; wires are connected to the metals from the prongs of the probe, and when the metal is touched either with the sides or points of the probe, simultaneously, electricity is very distinctly tasted on the white metal, and a flash of light will generally be seen.

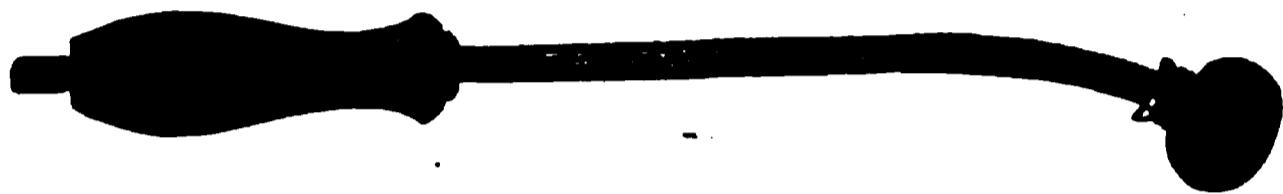


ELECTRODE FOR PERINEUM.
(*Medical Brief.*)

Goelet²³ has had the vaginal electrode made with a ball of carbon instead of metal, which allows it to be used with the positive as well as the negative pole. (Those made of metal can be used only with the negative pole, on account of the corrosion produced by the acids, which are attracted to the positive pole.)

The figure shows this electrode ready for use. The ball is surrounded with clay, evenly molded around it. It is then covered with a thin layer of absorbent cotton and a piece of gauze, which is held in position by means of a rubber band around the shaft of

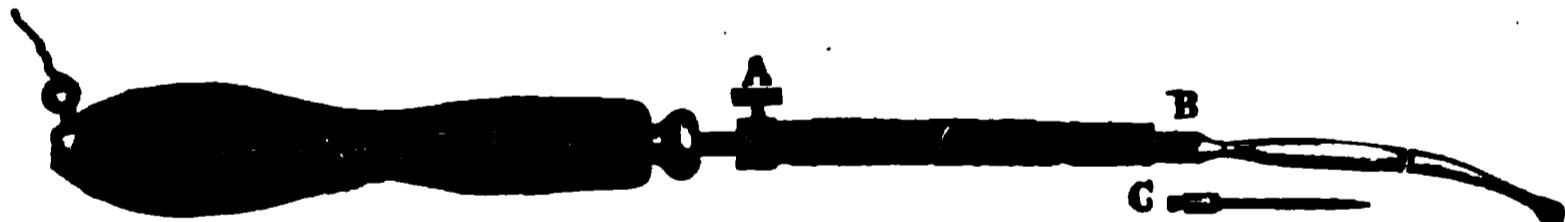
the instrument close to the ball. When it is to be used, another layer of absorbent cotton, much thicker than the other, must be adjusted over the gauze and merely twisted around the shaft, to hold it on, and it must then be thoroughly wetted. This is to be removed after it has been once used, and replaced by a fresh piece for the next patient. It must be kept wet, so as to be always ready for use. The clay forms a protection, which lessens the caustic action on the vaginal surface and is much superior to the ordinary covering of absorbent cotton or chamois-skin.



GOELET'S CLAY-COVERED UTERINE ELECTRODE.
(*Annals of Gynaecology.*)

He has also introduced an electrode with universal handle, which is a modification of the Apostoli platinum electrode, and much cheaper. (See cut.)

It possesses many advantages over the original instrument aside from the price. The shaft, which is of steel, is fixed in the handle, and the insulating sheath is fixed in any desirable position by means of a movable slide and set-screw, A. A platinum point of any desired length can be attached to the shaft by means of a screw at B. A puncture-needle of platinum arranged like that



GOELET'S INTRA-UTERINE ELECTRODE.
(*Annals of Gynaecology.*)

-when desired. In order to overcome the objection to the usual shown at C in the cut may likewise be screwed on the same shaft inflexible platinum probe, I have had it flattened somewhat antero-posteriorly, which thins out the metal and renders it as flexible as the ordinary copper uterine sound. It can even be made more flexible by thinning the metal more. This does not interfere with its value as an electrode, for it covers the same or a greater surface, the uterine canal being flattened antero-posteriorly.

Lewandowski¹¹³ has perfected a graphite quicksilver rheostat

which is constructed in the following manner: In the bottom of a hard-rubber cloth-lined cup is firmly set, a little below the surface of the floor, a metal plate, which has a metallic connection with right-hand post, L'; into this is neatly fitted a metallic cylinder, the upper end of which just fills up the opening in the glass dial, and is attached to the hard-rubber plate, D. Underneath the plate, D, are two metallic plates which are in close contact with the metal cylinder, and situated one above and one below the glass dial; from the upper of these extends the index, Z, which is firmly attached by rivets and reaches to the outer edge of the cup, where it can be rotated only to the right, a small projection, R, preventing it from being rotated in the other direction. From the outer end of Z extends a piece of platinum, which brings it in connection at 1 with the commencement of the stellate graphite track, situated on the under surface of the glass dial. This dial, with the metallic cylinder passing through its centre,—in fact, the whole above-described apparatus,—is held in place in the cup by the central screw, C, around which it may be rotated, or by unscrewing which the whole thing may be removed from the cup.

On the under surface of the dial is the stellate furrow, which is filled with a graphite mixture, smoothly leveled off even with the surface of the glass; one end of this continuous graphite track terminates at 31, the other is connected with the index, Z, as described above.

Between N and O (which letters are painted on the cloth) is a conical-shaped trough which opens at its base into the hollow space, S P, and contains a considerable amount of quicksilver; from the base of left-hand post, L, is a platinum-wire connection with the quicksilver. The top of this receptacle, S, unscrews and enables one to pour in the quicksilver, which, by means of a slide at the base of the trough, can also be shut off entirely from the trough, L, after inverting the instrument. When it is not so shut off the glass dial presses down upon the convex surface of the quicksilver in this trough and produces a broad, flattened surface of quicksilver, over which the graphite track is carried by rotation of the dial-plate to the right. From L and L' extend the conducting wires to the batteries and the electrodes. By turning the dial-plate and index to the right, the extreme end of the graphite track at 31 comes in contact with the smooth surface of the quicksilver;

and, if we suppose the current turned on, it must travel over the whole length of the graphite, thence through the index, Z, to the metal cylinder, from whence it is conveyed to the base of the cup, to the right-hand binding-post, to the battery, to the electrodes, to the left-hand post, through the platinum wire back to the quicksilver.

In the instrument here depicted the whole length of the graphite track equals 2100 millimetres, and a current of 2500 milliampères is reduced by it to 0.9 milliampère.

By further rotation of the instrument less and less of the

SP

LEWANDOWSKI'S RHEOSTAT.
(*Wiener Med. Prese*).

graphite track has to be traversed, until, at length, the full strength of the current is secured by complete rotation of the index, Z, so that it impinges against the opposite side of the projection, R. One can see at a glance how, when once the contact between the quicksilver and the graphite has been secured, there will be no break in the current possible until the index, Z, has been brought back to the position it has in the figure, under which circumstances there is a complete interruption of the current.

Eschle,⁴¹ constructed an electrode for cutaneous applications,

on the principle of the steel-wire hair-brush. Steel wires are fastened into a rubber plate, which is twisted on a wooden back, with a handle like an ordinary hair-brush. The separate wires are bound together and conducted to the binding-post, to which the wire from the battery is attached.

CLIMATOLOGY AND BALNEOLOGY.

BY GEORGE H. ROHÉ, M.D.,

BALTIMORE.

I. CLIMATOLOGY.

GENERAL QUESTIONS IN MEDICAL CLIMATOLOGY.

THE most complete and thorough recent work on medical climatology comes from Mexico,¹⁰⁶⁵ and was written by Domingo Orvañanos, at the request of the Minister of Public Works. It comprises 193 quarto pages of text, beautifully printed, with an atlas of 45 large colored plates, showing the altitude of different parts of the country, the distribution of races, meteorological conditions, water- and food- supplies, prevalence of various endemic and epidemic diseases, etc. It is a valuable and useful work. The chapters on leprosy, endemic goitre, yellow fever, and particularly the one on that curious Mexican disease, "Mal del Pinto," are full of interest to the medical geographer and sanitarian.

F. D. Bullard,⁴⁴ writes an essay upon the "Climatology and Diseases of California." The investigation may be summed up in the following conclusions of the author:—

"A comparison of these and other statistics shows that the same diseases are prevalent, in a greater or less degree, the world over; that some regions are better adapted for treating certain troubles than others, and that no one climate contains qualities which are the best for all diseases; so it is with Southern California. The cool reaction every night from the heat of the day gives refreshing sleep, and invigorates the body worn by wasting diseases; but this great daily change may give rise to rheumatic and neuralgic pains. The air—so bright, so dry, so clear, allowing the life-giving rays of the sun to shine through day after day—is delightful for the sick man to breathe, but its constant brightness may be too dazzling for his eyes. He who is marked by some dread disease may come too late to these genial shores to find, in its days of spring coolness and summer heat, too great a change for

a weakened body to endure; while, on the other hand, he whom the changeful climate of the East has warned by cough or wasting flesh to flee in time may here escape the blight entirely, and live in health to ripe old age."

Janssen¹⁶⁴ gives an account of an ascent of Mont Blanc, during which he made some interesting physiological observations. He found that when he was not exhausted by physical exercise his mental functions remained perfectly clear, contrary to the usual experience. When he took physical exercise he was rapidly fatigued and subsequently unable to perform any mental labor. He concludes from this experience that mental exertion can be successfully sustained at high altitudes if physical rest can be obtained.

CLIMATE AND DISEASE.

W. Everett Smith,⁹⁹ in an elaborate paper on "Some of the Relations of Climate to Health and Disease," combats the view of H. B. Baker (see ANNUAL, 1889, E-1) that dry air is a cause of disease of the respiratory organs. His conclusions are summarized as follows: 1. In tracing a connection between the weather and disease, the tendency is to go too far and ascribe to atmospheric conditions more of a causative influence than we can prove. Because a climate may expedite or inaugurate a cure is no inherent proof that a climate, even though it have the opposite atmospheric conditions, will, *per se*, cause the disease. 2. Climate means more than the weather, and includes data concerning the contour of the land, the situation of hills and forests, and the nature and chemistry of the soil. 3. With no reason can we measure a climate by its absolute humidity alone, or ascribe to absolute humidity the supreme control over the origin of disease. Coincidence of data does not necessarily show a causative relation. 4. The degree of absolute humidity is more a resultant than a cause of atmospheric conditions, although it may be frequently a *mediate* cause of atmospheric *changes*. In no way, however, can we measure the value of absolute humidity or discuss its influence upon our bodies until we bring it into relation with something beyond itself. We are, therefore, constantly discussing *relative* humidity,—if we use the English language with its proper meaning. 5. To assume that the weather controls health and causes disease by its influence upon the respiratory

organs alone is utterly to ignore the vascular and secretory systems of the body, with their important functions. The assumption being unwarrantable, all conclusions and inferences based upon it are illusory. 6. *Absolute humidity*, *per se*, can have no influence upon health. Its influence depends upon the temperature and accompanying atmospheric conditions. A *low absolute humidity* in *cold air* is the mediate factor in abstracting *heat*, not moisture, from our bodies. A *low absolute humidity* in *hot air* will abstract *moisture* from our bodies proportionate in amount to the degree of *relative humidity* in which our bodies live. 7. *Relative humidity* measures the moisture-absorbing powers of the air, is an expression of our surrounding atmospheric relations, and is modified by and gives us a working notion of the direction of the winds and, at times, of the amount of sunshine. It represents conditions that are necessary to health and essentially local in their nature. It is therefore of great value to the physician. 8. The best single datum to be used with the temperature is the *dew point*, since, in combination with the temperature, it will enable us to determine both the *absolute* and the *relative humidity*. Definitely given, also, the amount of sunshine or of cloud, we can form a fair idea of the hygienic value of a given locality to health. 9. Condensed moisture has a great influence upon health. In some of its phases it is equally as important as humidity (aqueous vapor). When in the form of mists, exhalations, and fogs it has, unfortunately, often been confounded with humidity. 10. The chief atmospheric conditions modifying health, and therefore causing disease, are sudden and violent *daily ranges in temperature* and secondarily *in relative humidity*. 11. The *barometer* is an important but too frequently neglected instrument. A single observation of it gives us nothing that is of true value until it has been compared with preceding and succeeding inspections. The barometer should, then, be in a physician's office for daily use and not for mere display. 12. We know, beyond doubt, the influence which certain low and wet localities exert upon health, but we do not understand completely the "why" of this influence; so that we are not yet able to formulate with precision the general law under which our empirical observation is a particular instance. 13. I venture the prediction that, when in future years our knowledge of the electricity of the atmosphere is more completely studied, we shall find in that mysterious

force some solution of this problem. But I spin no gauzy theories upon the subject."

H. B. Baker,⁶¹ continues his previous investigations (see ANNUAL, 1889, E-1) on the influence of meteorological conditions upon the production of diseases of the respiratory organs. In a memoir upon the "Climatic Causation of Consumption," he seeks to harmonize the three notable generalizations of the last quarter of a century bearing upon the etiology of consumption. The first of these generalizations is that of H. I. Bowditch, that residence on low, moist soil tends toward the occurrence of consumption. The second is the one strongly supported, and, indeed, one may say almost established, by Baker himself, that the inhalation of cold, dry air tends toward the production of consumption; and the third is "the dominant generalization of our own time, that consumption has one *specific cause*, and that cause the *bacillus tuberculosis*."

The author points out the difficulty of accepting all three of these propositions as true, but believes that each one of them rests upon a secure foundation, and that as soon as this is generally accepted "it will be possible to hold a much more complete and useful view of the causation of consumption than has previously been possible,—a view which shall recognize the facts (1) that inoculation of a susceptible animal with the *bacillus tuberculosis* generally tends to cause consumption in that animal; (2) that, notwithstanding a wide dissemination of this specific cause, accidental inoculation with it, or its permanent lodgment in the human organism, is more favored under certain climatic conditions than under others; (3) that, even after its introduction and lodgment in the organism, residence in cellar-like places tends to make the disease more fatal than does residence in more elevated, well-drained, warm, and sunny places."

The investigations of Baker seem to show that the generalization to the elucidation of which he has devoted so much labor is largely concerned in the production, primarily, of irritative diseases of the pulmonary organs, and, secondarily and consecutively, of consumption. While regarding the influence of cold, dry air as being of controlling importance, he does not exclude the other two causes,—moisture of soil and the tubercle bacillus,—but holds that all three are essential elements in the production of the disease; that, in other words, the causation of consumption is complex. He

continues: "It seems to be difficult for the human mind to grasp more than one idea at a time. Accordingly, we find a strong tendency to assume that there is, and can be, but *one* cause or essential condition leading to consumption; but nothing is more certain than that the forces and reactions in nature are complex. But, although complex, I believe the problem is now within our grasp in all its most important features, if we only hold fast to the truths we have learned of the relations of consumption to low, wet places, while we grasp the obverse idea of the favorable influences of high, dry, and sunny places; hold fast to this double image of one great truth, while we lay hold of that one which teaches us the great importance of proper clothing, food, and all that goes to make the nourishment of the body fully equal to all demands upon it; hold fast to this rather complex thought, while we grasp the great truth which Robert Koch has given us,—that there is a specific cause which, *under favoring circumstances and conditions*, is an essential factor in the causation of consumption; and, while holding all this in mind, I ask you to consider how it is that this specific cause usually enters the body, and the fact that, just as the specific causes of many other diseases enter and cause the disease in proportion to the coldness and dryness of the atmosphere, so the specific cause of consumption apparently and probably finds lodgment in the lungs and air-passages, other things being equal, in proportion to the coldness and dryness of the atmosphere. And not only this, but the danger of auto-infection and of death to one in whose body the disease is already present is increased by exposure in an atmosphere unusually cold and dry, while the condition of the blood is such that saline and albuminous exudates are liable to occur in the air-passages.

" Finally, in order to grasp the most at once, we need to link the facts together, realizing the fact that over the low, *wet soil* there is generally a *cold, dry atmosphere*, thus making it plain that the facts observed and collated by Bowditch and Buchanan are entirely in harmony with those observed by Koch, and with the enormous number of facts which I have tabulated, and which prove beyond question that there is a causal relation between the inhalation of such an atmosphere and the occurrence of all the ordinary diseases of the air-passages and of those communicable diseases which enter by way of the air-passages, including tubercular consumption."

C. W. Purdy¹ has made a study of the relations of climate to Bright's disease in the United States. Taking the census of 1880 as a basis, he finds that the recorded deaths from Bright's disease are greatest in the Middle and New England States and the smallest in the South Atlantic and Gulf States. He summarizes the results obtained from a careful statistical study as follows:

1. That the chief features of the climate in the United States which most strongly tend to increase the death-rate from Bright's disease are cold, moisture, and changeability of temperature.
2. That the elements of climate which tend in the greatest degree to decrease the death-rate from Bright's disease are warmth, dryness, and equability.
3. That cold most markedly increases the mortality from Bright's disease when associated with moisture, a comparatively low temperature being well borne if the atmosphere is a dry one.
4. That a comparatively high degree of humidity of the atmosphere does not markedly increase the mortality from Bright's disease if accompanied by warmth and equability.
5. That the most unfavorable residence localities for patients afflicted with Bright's disease in the United States are comprised within the Atlantic Coast Region and Northeastern Hills, which include the States of New Jersey, New York, Connecticut, Massachusetts, New Hampshire, and Vermont.
6. That the most favorable residence localities are chiefly comprised within the Southern Interior, and especially include the States of Tennessee, Georgia, North Carolina, Arkansas, and Texas.

R. Longuet² reviews several recent contributions of Clément, Goldberg, and Kelsch on the influence of meteorological elements upon health and life. Clément (see ANNUAL, 1890, E-33) tabulates the mortality of Lyons by seasonal and monthly periods for twelve years. The average annual mortality was 24.77 per 1000. The autumn furnished the lowest average, 21.27 per 1000; then came the summer, with 24.24 per 1000; the spring, with 26.09 per 1000; and winter, with the highest average, 27.48 per 1000. When the meteorological conditions were not unusual for the season, these relative averages were maintained. Exceptions to the regular rule occurred in 1877, 1882, and 1884. In these years the highest mortality occurred in the spring, but in this year the winter had been particularly mild, while the spring was cold. In the other two years mentioned there were fatal epidemics of

scarlet fever, measles, and small-pox in the spring months. The most remarkable anomaly occurred in 1881, when the highest mortality was reached in summer, which was exceptionally hot after a winter only at times severe. By months, the highest mortality was in February and two minima in June and September.

Studying the distribution of infectious diseases throughout the year, Clément found that the relations were as follow: In 1000 deaths from infectious diseases, 193 occurred in autumn, 220 in summer, 252 in winter, and 325 in spring. In winter and spring the weeks with lowest temperature had the highest mortality.

Goldberg has studied the influence of the weather upon health in a more comprehensive manner. His researches are based upon the official sanitary statistics of Berlin, Hamburg, and Cologne, compared with the meteorological data.

For typhoid fever Goldberg found that at Berlin, when the temperature of the soil at a depth of $\frac{1}{2}$ to 1 metre was elevated, the fever increased. The rise and fall of the ground-water, the hygrometric condition of the air, and the prevalence of typhoid fever correspond for Berlin and Hamburg.

The phthisis mortality is dependent upon the temperature; in the cold season it rises with the fall of temperature and in summer rises with a higher temperature. From July to September is the most favorable season for consumptives in the central parts of Europe.

Diphtheria is less frequent during hot and dry seasons.

Cholera infantum is directly dependent upon thermic conditions. The hottest year in a series, the hottest month in the year, and the hottest week in a summer month always co-exist with the maximum death-rate from cholera infantum.

Measles appears to be less frequent after moderate than after severe winters. Scarlet fever is doubled after rains; small-pox and typhus fever show no relation to the weather. Kelsch discusses the seasonal catarrhal affections based upon reports of military medical officers. His conclusions appear to be contrary to those generally accepted, inasmuch as he assumes that the meteorological factors are merely secondary, the prime cause being germs, whose development and penetration of the organism are facilitated by the meteorological and other conditions.

P. C. Remondino¹⁰⁰⁸ has written an elaborate paper upon the

relations of climate to longevity. He takes the ground held by Hufeland, that the strict observance of nature's laws is the true life-prolonger, and follows that author in the firm belief that the keeping of these laws or the deviation from them is a matter altogether influenced by climate. Ill health, disease, premature decay, and death through bodily infirmities are not the natural inheritance of man; he should pass away by that Euthanasia so well described by Richardson,—a process which is the natural physiological end of man, and as unconscious and painless as that of birth. He then proceeds to the discussion of climate, as it influences the production of food, and as it determines its needs from the position that it here forms by the food, the character, habits, and characteristics of not only the individual, but that of a nation as well. The subjects of drink, dress, personal tastes and habits, as well as that of occupation in its influence on longevity as determined by climate, are fully discussed in detail. He explains Hufeland's ideal climate for the prolongation of human life, consisting of a mild, equable, marine air, of a cool medium, with a constancy of meteorological conditions and a dry, warm soil, with the greatest possible facility for ventilation and out-door exercise, as well as freedom from any disturbing element; this ideal climate should be seasonless, and where man may live on the simple fruits of the earth and partake of its pure water as his drink, as it was intended that he should live in that biblical Eden, with all its fruits and its four intersecting rivers. From seventeen years' observation, he claims that in Southern California is to be found Hufeland's ideal climate, supporting his assertion with a host of living examples and from the evidence of the effects of marine climates elsewhere, quoting largely from history many well-known facts relating to the endurance, hardship, health, light-heartedness, and longevity of people who lived in a mild marine atmosphere. Remondino has sent me photographs of the old Indians, to whom he refers in his paper, and they almost confirm the picturesque legend that in Southern California and Arizona the aboriginal inhabitants never die,—they just dry up and are wafted away by the wind.

Tommasi-Crudeli¹⁷⁴ regards the generally-accepted view that the eucalyptus-tree is protective against malaria as a fallacy. He states that in 1880, 1882, and 1885 many of the laborers at the

Tre Fontane, where the eucalyptus plantation was supposed to render the district healthy, were attacked by fever. He sums up his opinions upon this point in the following words: "If we take into consideration the many reasonable doubts of the hygienic efficacy of the eucalyptus and the cost at which such plantations are made, we must conclude that the enthusiasm for the eucalyptus is not justifiable. This tree is very capricious. It is often killed by frost in winter, by damp, cold, or by frost in the early spring. At other times, when the winter is mild and the soil deep, these trees grow very high, and are snapped like sticks by even a moderately strong wind. Plantations of eucalyptus are very costly. If the soil is swampy it must be drained, or the roots of the tree will decay. If the soil is very heavy, deep ditches must be dug for the long roots of this tree, and these ditches often require to be drained, for fear the water which has filtered in may destroy the roots. . . . You will often hear it remarked in society in Rome that the plantations of Tre Fontane have increased the healthiness of Rome by intercepting the malaria which is carried by the wind from the sea-coast marshes in the direction of the city. If this were the case, the south side of the city would benefit most, as it is nearest to the Tre Fontane. But this is exactly the part in which no improvement has been felt since 1870, for the very good reason that there are no buildings there to prevent unhealthy emanations from the soil. When the new quarter, 'Testaccio,' and other new buildings have covered the soil of this part of Rome, the aspect of things will change; but until now the eucalyptus plantations have not affected the malaria of this part."

L. Martin, who had practiced seven years on the north coast of Sumatra, divides the morbific factors of tropical climates into the climatic and infective. The only purely climatic factors are the high average temperature and the great humidity.

The infective factors are almost exclusively malarial in nature. Appropriate clothing, food, mode of life, and general hygienic care lessen the influence of the climatic morbific factors.

Surgeon-General Jeffery A. Marston⁶ gives a practical paper upon "Tropical Life and its Sequelæ," which touches upon many points in acclimatization of Europeans. He refers particularly to the neurasthenia, anaemia, and tropical diarrhoea and their treatment. In the tropical diarrhoea, "psilosis" or "sprue," he

regards a milk diet as essential to cure. A curious instance of British military economy is related in the following anecdote: In 1865 a gunner belonging to the Royal Artillery Depôt was about to be discharged from the service. He applied to have 30 shillings, which had been stopped from his advance of pay on embarking for India, refunded, as he had not required his coffin nor incurred any expense for his funeral rites. The matter was referred to the Indian Office, the soldier's claim was found valid, and the sum was refunded. It appears that we are consequently within measurable distance of the time when the mortality among troops arriving in India was so great as to require the government to safeguard itself against the expenses attending soldiers' funerals. It is gratifying, on sanitary as well as humanitarian grounds, that this sort of economy is no longer practiced by the British War-Office.

Acclimatization.—This topic was discussed at the International Medical Congress at Berlin by Stokvis, Van Overbeek de Meijer, Hirsch, and others. A lengthy analysis of Stokvis's address is given,⁶ from which the following abstract is taken:—

The two chief enemies with which the European living in the tropics has to contend are the altered thermic conditions and the endemic infectious diseases. The thermic conditions include not only the higher temperature, but also the other meteorological factors which influence the human organism by causing disturbances of its temperature-regulating mechanism. Now, as regards the peculiar thermic conditions, we know, from the observations of Davy, Brown-Séquard, Maurel, and Jousset, that the individual members of all the tropical races, whether Hindus, Anamites, Senegambians, Malayans, or the like, manifest certain physiological differences from Europeans and from the inhabitants of the temperate zones. The number of respirations is increased; the vital capacity of the lung is diminished; the thorax is of less circumference; the abdominal respiration less marked; the pulse is increased in frequency, its tension is diminished; the abdominal organs are richer in blood; there is increased secretion of sweat and diminished secretion of urine; the body temperature is from 0.5° to 0.6° C. (0.9° to 1.08° F.) higher, and the body weight is diminished in proportion to the length of the body. As regards the animal functions, a diminution of the tactile sense and of the special senses

has been observed. These races are inferior to Europeans not only in mental power, but also in muscular strength; whilst in sexual power they excel their European brethren. These physiological variations are, however, not due to any peculiarities inherent in the race, but depend on the higher temperature in which these races live, and the same variations are noticed in people living in the moderate zones during the hot summer weather. When the European is put into a tropical climate, he, after a period of transition, acquires the same physiological alterations as the natives. He becomes, according to Stokvis, a permanent summer being (*Sommermann*), as shown by the observations of Davy, Jousset, Rattrey, Féries, and others. The tissue metabolism becomes diminished; the urine becomes more concentrated, is rich in inorganic salts and poor in urea. No alteration takes place in the condition of the blood, which, according to exact observations made by Marestang, shows a normal amount of haemoglobin and the normal quantity of blood-corpuscles even after prolonged resistance. Now, as the temperature-regulating centres of the European easily adapt themselves to varying changes of the surrounding temperature, we may, *a priori*, expect that he will offer greater resistance to the vicissitudes of the atmospheric changes; and that this is so is shown by the fact that in all colonies the European soldiers suffer much less from diseases of the respiratory organs (such as bronchitis and pneumonia) than the native troops. Sun-stroke appears to affect the European more than the native, but the mortality from this source is very small, and other factors, such as difference in clothing, etc., are to be taken into consideration.

On the other hand, it is evident that the physiological alterations dependent on the higher temperature predispose the European to certain affections, especially those of the chylopoietic system and of the skin, just as with us disturbances of the digestive tracts, such as gastric catarrh, diarrhoea, and affections of the skin, are more prevalent in summer than in winter. We can thus understand that hepatitis is more common amongst Europeans living in the tropics than amongst the natives.

In India the mortality of European soldiers from hepatitis during the past twenty years was from 1 to 2 per 1000 per year, whilst of the native soldiers the proportion was from 0.14 to 0.4 per 1000. The mode of life, especially the abuse of alcoholic

drinks, is here again a very important item, and, with improved hygienic conditions and a more rational dietary, the mortality has largely decreased during the last fifty years. For the European to adapt himself to the altered conditions of the tropics, it is essential that he should avoid all excesses and all things which tend to weaken his resisting powers, and that he should carefully observe all hygienic rules. The reports of the English Royal Commissions show this in a striking manner. Thus, from 1800 to 1850 the yearly mortality of the European soldier in India was 84.6 per 1000; from 1830 to 1856 it fell to 57.7 per 1000; from 1869 to 1878 there was a further decrease to 19.34 per 1000; and from 1879 to 1887 it reached the low figure of 16.27.

Considering now the effect of infectious diseases on Europeans living in the tropics, we have, in the first place, malaria, which has always been considered a scourge to the Europeans, whilst the natives, especially the black races, were supposed to have a kind of immunity from this disease. The statistics, however, which Stokvis might have quoted tell a very different tale. In India the Hindu and Sepoy show the same rate of mortality from malaria as the English soldier, whilst the morbidity amongst the native troops is greater than amongst their European comrades. It is different with typhoid fever; this is more common amongst the European than the native soldiers.

As regards yellow fever, it is well known that it affects chiefly those Europeans who have only resided a short time in the tropics. It is, therefore, not the peculiarity of race which must be made responsible for the large mortality amongst the Europeans, but rather the want of resisting vital power of those who are not yet acclimatized. Dysentery and cholera, which at one time caused such great ravages amongst the Europeans, have been successfully combated by the adoption of sanitary measures; in India the mortality from cholera amongst European soldiers has now fallen to 3 per 1000, whilst in 1868 it was 18.6 per 1000. On the other hand, beriberi, which was thought to attack chiefly the natives, appears, according to more recent statistics, to find many of its victims amongst the Europeans.

The conclusion, then, at which Stokvis arrives is, that the power of resistance of the healthy adult European living in the tropics quite equals, and in some measure is even superior to, the

vital power of the native races. This opinion was expressed by James Lind more than a hundred years ago, and is now held by most English and French authorities, as Horner, Sir Joseph Fayrer, Duncan, Jousset, Dutroulau, Corre, and others. On the other hand, it seems that there are certain peculiarities of the race which have been gradually acquired by inheritance from generation to generation, and that the longer the European resides in the tropics, the more likely is he to lose his superior resisting powers; and it is possible that the European Creole is, both bodily and mentally, inferior to the European.

The conclusions of Van Overbeek de Meijer are much less favorable to acclimatization of Europeans and Americans in the tropics than those of Stokvis and the *Lancet*, quoted above. He points out that the European has no prospect of maintaining his full bodily and mental functions and powers. His vital energy constantly diminishes, and this diminution is also seen in his progeny. Boudin has shown that a European colony in the tropics exhibits a progressively increasing mortality, especially if the immigrant busies himself in field-labor. A pure-blooded third generation of Europeans is not to be found in the tropics. The Italians and Spaniards resist the morbific influences of tropical climates better than the inhabitants of more northerly countries. Hirsch, although claiming no personal experience in tropical countries, agreed with the conclusions of Van Overbeek de Meijer, and referred to the recent work of Sir William Moore¹⁰⁶⁷ as containing evidence in support of the statement that European colonies are not able to withstand the deleterious influences of tropical life unless fed by new immigration or intermarriage with the natives.

CLIMATOTHERAPY.

S. Riva-Rocci⁴⁷⁴ has investigated the clinical effects of high altitudes upon the respiration. He agrees with Forlanini that it is not the mere change of atmospheric pressure at mountain resorts that produces beneficial effects in pulmonary diseases, but it is necessary to lead an active life, like the mountaineers. For this reason, resorts with gradual ascents, permitting systematic and regular increase in exercise, are more beneficial than places where one simply idles the time away.

Liebreich⁴¹ discusses the defective hygienic conditions of

health-resorts. If epidemics occur in such places something must be wrong with the sanitary conditions. He points out that the meat-supply is not regulated; that no control is exercised over the hotels and boarding-houses into which patients are admitted; that a newly-arrived patient may be placed in a room formerly occupied by a case of infectious disease, and where no disinfection had been practiced; that the drinking-water is often polluted and the source of disease, and that many other things require reformation before the places can be recommended from a sanitary point of view.

This subject is of sufficient importance to claim the attention of sanitarians in this country, for many of our so-called "health-resorts" are merely breeding-places for the dissemination of infectious diseases; I could easily name several from my own observation.

J. W. Stickler¹, gives some "thoughts and observations at health-resorts," which are worth quoting entire. Unfortunately, those for whom they are intended are not likely to look for them in a medical review. Stickler's observations are as follow:—

"Many invalids may be found on mountain-tops and in the valleys who ought to go home and remain there. The great majority of invalids who are now in their own homes should stay there. Money cannot buy or friends provide home comforts in hotels or boarding-houses. Big fees or little do not prevent 'drummers' coming and going at various and unseasonable hours and slamming doors, all of which is not conducive to sleep or helpful to persons who go from home to secure undisturbed slumber.

"Patients who cannot sit upon the piazza at home without risk after sundown may sometimes be seen knee-deep in a trout-stream, or perched upon a log or cold rock in the damp woods watching for deer, immediately after reaching the 'health-resort.' This is not the best nor quickest road to health.

"Dancing in a hot and crowded parlor or ball-room till 11 or 12 o'clock in the evening, with an occasional walk or flirtation on the piazza for the sake of getting 'cooled off,' does not appear to be a satisfactory method of treatment for phthisical patients, or persons whose throats and lungs are weak.

"The man or woman who goes to the mountains for fresh air as a remedial agent and sits all day in a hotel may as well go home

on the first 'limited express,' unless the individual is to be satisfied with minimum instead of maximum benefit.

"The invalid who stays at a health-resort just long enough to get rid of troublesome symptoms, and then goes back to business or home duties or responsibilities, very often goes home to die.

"Damp sheets and a strong draught do not, as a rule, tend to re-establish a normal condition of body.

"People who occupy rooms over foul-smelling water-closets and on the side of the hotel where the sun never shines do not seem to get well so quickly as those who live on the sunny side and away from cess-pool infection.

"Residence in a fine hotel in a malarial district does not cure malarial disease. A short stay in an elevated region which is non-malarial will often 'develop' latent malarial poisoning. This is also true of some *low* non-malarious districts.

"When an invalid finds a health-resort which furnishes what he needs he should stay there until he becomes strong and well.

"Every man, woman, and child who has phthisis in its primary stage should at once go to the best climate this country furnishes."

An editorial article¹ gives some particulars of recent improvements at Trudeau's Sanitarium at Saranac Lake. Two new cottages are now being built, which will raise the accommodations to 60 patients. A pavilion will be erected where billiards and other mild exercises may be followed when the weather is bad. A few free beds will be maintained for patients who are properly recommended.

Unfortunately, in few of the places possessing a climatic reputation for the cure of consumption is there any opportunity for poor people to make a living while endeavoring to save their lives. Sanatoria are for the well-to-do, and have their reason for being, but settlements in favorable climates are needed where various industries can be started and maintained to enable the poor to derive the same benefits.

Dettweiler stated, at the Tenth International Medical Congress, that he has found that, when kept under proper surveillance in a properly conducted sanitarium, meteorological changes have little influence upon the well-being of consumptives. After having closely observed about 9000 cases of consumption in the course

of twenty years, he attaches little importance to meteorological factors, provided the sick are subjected to rational management. P. H. Kretschmar, in discussing the question, referred to the fact that certain localities were exempt from phthisis, and urged that in establishing sanatoria for consumptives such localities should be selected.

E. Friedrich¹, discusses the question of the presence of sodium chloride in sea-air. He quotes from the researches of a large number of observers, who have demonstrated the presence of common salt in the air at the sea-side, and shows that while there is a small proportion of salt in the atmosphere, it is due to the diffusion of minute particles of sea-water in the air. The proportion of salt is increased during strong winds which blow the fine spray inland, and may thus carry it some distance from shore. Friedrich thinks the proportion of sodium chloride is too small to exert any therapeutic influence. The good effects of sea-air in phthisis, pleuritic effusion, asthma, and other affections, are probably mainly due to the sedative influence of an equable climate and a high humidity.

E. Magnant¹⁸⁴ relates an experiment during which he and three others sustained a temperature of 95° C. (203° F.) for thirty-five minutes without discomfort. The experiment may be taken to prove the innocuousness of hot-air inhalations, should it be deemed desirable to continue their employment in phthisis.

An editorial article²² gives some excellent advice upon the subject of "Wintering Abroad." The writer, after pointing out the benefits to be obtained, in many cases, from a change to a more favorable climate, gives this warning:—

"It should be a question for serious consideration whether it is right for any medical adviser to encourage what may probably be a final banishment from friends and relatives. Where there is any imminent danger from the actual change and long journey, medical men will know how to act, but it is equally necessary for them to keep on guard against sending out doubtful cases, especially when the doubt is against the patient." It is further pointed out that patients limited in means had better stay at home than go to a foreign resort, where they would be compelled to put up with discomforts that would probably aggravate their condition.

I. Burney Yeo²³ replies briefly to those English physicians

who have advocated British health-resorts in preference to those in the Riviera and elsewhere on the Continent. Comparing Falmouth, which is lauded by Sir Edward Sieveking as a suitable winter resort for such patients as are usually sent abroad, with San Remo, Yeo shows that at the latter station the hours of sunshine are more than three times the number at Falmouth. The mean temperature is, on an average, 6.4° F. (3.5° C.) higher, and the number of rainy days only a little over one-fourth as many.

Valentiner^{Mem. 2, 10, 24; Apr. 21 to May 5; June 2 to 22}⁴ discusses at length the therapeutical advantages of sea-voyages in pulmonary and other complaints. He advises long voyages in southern seas; for example, from Southern Europe to South America, Australia, and India. The voyage should be interrupted at various points *en route*, or a longer interval should be spent on land before beginning the return trip. Favorable seasons should be selected for the voyage. The beneficial results are most noticeable in cases not far advanced. Where there is great debility, heart disease, or advanced lung disease, sea-voyages are not beneficial.

The opinions of various eminent authorities upon the same subject are excellently summarized by C. H. Wade,²⁵ who says: "The use of a sea-voyage in consumption is a question which has often exercised the minds of medical men, and the conclusion generally arrived at undoubtedly is to the effect that there are stages of the disease which unquestionably admit of much improvement under the circumstances attending life at sea. The absolutely pure air, the constant soft nature of the atmosphere, the abundant sunshine, and the unusual freedom from clouds all combine to influence for good the unfortunate victim of phthisis. To this effect abundant testimony is now forthcoming from observers of proved capacity; but it must, at the same time, be admitted that a few instances of injury have to be recorded, mainly owing to the fact that cases unsuitable for the treatment in question have occasionally been subjected to it. Perhaps a due amount of discrimination has not always been exercised in this connection; and patients in a late stage of disease, worn out by exhausting discharges, broken down by long-continued ill health, incapable of exertion, and needing, more than anything else, complete repose, have sometimes been dispatched to undergo the sea-cure when the most urgent indication should have pointed to rest at home. The

favorable experience of C. J. B. and C. T. Williams in this connection has been fully borne out by that of Austin Flint in America, and J. A. Lindsay, of Belfast,⁵ quotes several other authorities who insist on the beneficial result of sea-voyages in the class of cases in question. Lindsay's own conviction is that the usually received impression, to the effect that hæmorrhagic cases do badly at sea, is not sustained by evidence; he has only known of two instances in which serious bleeding took place under the conditions named, and in neither of these did any bad consequences follow. He justly points out that treatment of phthisis by residence at high altitudes was formerly held to be impracticable in hæmorrhagic cases, and concludes that it is just as fallacious to regard this complication as a bar to sea-voyaging. On the subject of fever he admits that patients exhibiting high pyrexia should not be submitted to the uncertainties of a long journey and lengthened separation from home; but, given this proviso, fever need not *per se* contra-indicate resort to the sea-cure. It may be taken as a good general rule to follow that any case in which the phthisical changes are far advanced is unlikely to prove a suitable one for such treatment; and probably this admission would now satisfy most of the objections raised against it, though some authorities, like Burney Yeo, believe that exceedingly few consumptives ever do derive real benefit from the sea-voyage. While, however, we have the authority of such observers as Walshe, Douglas Powell, Wilson, and Herman Weber in support of a contrary opinion, it can hardly be doubted that practitioners will be swayed in the direction of urging resort, in suitable cases, to a method of remedy which seemingly offers the prospect of certain improvement. Nor is it consumptives only whom the rest, calm, and healthful surroundings of a life at sea are calculated to materially help toward recovery. The victims of neurasthenia, of overwork and brain worry, are peculiarly fit subjects for such a plan of treatment; while sufferers from debilitating diseases and scrofulous subjects will find in it a more effectual restorative than any other that is open to them. In a word, the therapeutic value of sea-voyages, as possible in the present day, is scarcely to be overrated.

H. C. Jones²⁰² gives a glowing account of the advantages of Florida as a residence for consumptives. The climate is equable and dry, the temperature is not excessive, and even in the rainy

season the rain-fall is rapidly absorbed by the sandy soil. A point of importance is emphasized by the writer, who calls attention to the opportunities for industrial development in the State. This is one of the vital difficulties in the problem of the climatic treatment of disease. Not only must a favorable climate be found for the actual or prospective invalid, but he must be given facilities for making a living, in order that he may remain where he is benefited.

J. V. Shoemaker¹²¹ gives a captivating picture of the climatic benefit of Tarpon Springs, on the west coast of Florida, especially in cases of skin disease. He also claims for this place exceptional advantages as a resort for consumptives. Shoemaker mentions particularly strumous, neurotic, and secretory affections of the skin, in which he has seen benefit follow a residence at this resort.

The climatic characters of Salt Lake City are given by F. S. Bascom.⁶¹ He claims moderate elevation (4348 feet), low relative humidity (44 per cent.), moderate range of temperature (18.6° F.—10.3° C.), and a fair proportion of sunshine. He also points out the advantages of the numerous sulphur springs and the bathing in the waters of the Great Salt Lake.

Arizona, as a health-resort, receives warm praise from C. L. G. Anderson.⁵⁹ He speaks of the moderate temperature of the neighborhood of Yuma, where the mercury climbs to 118° to 120° F. (47.8° to 48.9° C.) in the shade, and yet "sun-strokes are unknown;" he refers to that eternal story of Bill and his blanket, which every one who ever met an Arizona man had to listen to on pain of summary punishment; he quotes poetry and Tyndall, and tells us that there is no consumption; the Indian squaws are contemporaneous with "She;" wounds require no surgeon's dressing, and "the bodies of dead cattle literally dry up and blow away!"

C. von Ruck⁹, claims that while climate counts for much in the treatment of consumption, rational management in a sanitarium adds to the proportion of recoveries. Incidentally, he says a good word for Asheville as an all-the-year-round resort.

T. G. Horn⁶¹ sounds the praises of Colorado Springs in all pulmonary diseases. The indications given do not differ materially from those heretofore published in the ANNUAL. The same may be said for a paper by H. B. Moore.¹ He finds the reasons for the relative immunity from pulmonary diseases in Colorado to be

the dryness and tenuity of the air (sunshine), the opportunities for out-door life, and the sandy soil.

P. C. Remondino¹⁰³ contributes an elaborate paper on the "Marine Climate of the Southern California Coast and its Relations to Phthisis." He gives a pretty full and fair description of the climatic peculiarities of the coast, foot-hill, and mountain climates. The paper will repay careful study.

F. Gundrum⁸⁰ writes with apparent fairness of the coast climate of Southern California. In his own case ("chronic bronchial catarrh, with asthmatic tendency") the coast climate was irritating in the extreme. Farther inland, and at an elevation of 1400 feet, he found more favorable atmospheric conditions, but there were still many serious drawbacks. Physicians contemplating sending patients with pulmonary disease to this part of the country should first read carefully Gundrum's paper.

Banff, on the Canadian Pacific Railway, is lauded as a resort for patients with incipient phthisis, hereditary tendency to tubercular diseases, neurasthenia, hay fever, and dyspepsia. J. Murray M'Farlane²⁵⁷ writes enthusiastically of its many climatic and other advantages.

Boardman Reed⁹ recommends residence at Atlantic City during the summer months as preventive or curative of gastro-intestinal diseases in children. His experience in cases wasted and debilitated by long-continued diarrhoea is that there is usually a rapid improvement. He attributes the effects largely to the climatic and sanitary conditions of that resort.

Reed¹⁰⁴ also writes of the sanitary conditions of health-resorts, showing the great improvements that have been made at Atlantic City in the matter of water-supply and sewage disposal.

The "Report of the Children's Sea-Shore House" at Atlantic City shows that during the year 1889 567 children and 162 mothers were admitted and treated in the institution. The average number of days each child remained was twelve and one-fourth, and the daily average number of inmates was 96. Of the more prominent causes for admission, the following are worthy of note: Debility, 277; diarrhoea, 83; difficult dentition, 40; coxalgia, 18; acute bronchitis, 15; malaria, 11; Pott's disease, 8; other strumous (local tuberculous?) diseases, 8. Four of those admitted died during the year.

The work of this charity is highly useful, and should be extended.

W. F. Hutchinson⁷⁰⁰ continues his interesting itinerary of the West Indies. The descriptions of the islands, the people, and the sanitary conditions are lively and of practical use, and, if in book-form, would serve as a guide-book for health-seekers to the West India Islands.

G. Bardet⁶⁷ describes the climatic advantages of the coast of Brittany for the establishment of sanatoria. The mean annual range of temperature is less than at Nice, Paris, the Landes, or Dunkerque; the average minimum temperature at Val André, in Brittany, being 5.5° C. (42° F.) and the average maximum 16.8° C. (62° F.). In six years the average number of days of frost annually was 16 for Val André, 17 for St. Malo, 18 for Brest, 19 for Nice, 35 for St. Martin de Hinx, near Biarritz, and 68 for Paris. The rain-fall is less than at Nice, although the average number of days on which rain fell in six years was more than twice as great (62 days and 757 millimetres for Nice, 131 days and 580 millimetres for Val André). In 1889 there were 108 clear, 80 fair, and 143 cloudy days.

Norderney, in the North Sea, is recommended as a winter resort for consumptives by Rinck.⁴¹ The mean temperature of the five winter months, from November, 1887, to March, 1888, inclusive, was 5.7° C. (42.5° F.). There are very few days of sunshine. Violent storms are not rare. It seems hardly necessary to advise a patient with any pulmonary complaint to stay away from a resort like Norderney in winter, in spite of the fact that there is "daily communication with the mainland and abundant hotel accommodation."

In the ANNUAL for the past three years numerous references will be found relating to the health-resort, Davos, in the Swiss Engadine. One of the best descriptive papers on the place is that of J. Gelbke.¹²³ There are about twelve large hotels and many boarding-houses, containing altogether accommodations for about 2000 patients; four churches, two apothecaries, several restaurants and shops, and many places of amusement. Walks and promenades arranged on the principle of Oertel's "terrain cure" are found. The village, or, perhaps, more properly town, is lighted by electric lights.

The time for out-door life is from 10 to 4 o'clock. While the

air is cold, it is dry, and the bright sunshine makes out-door life not only bearable but enjoyable. The patient can walk, sit, skate, or coast on sleds. Patients confined to bed may have the windows open during day or night. About the middle of April the snow begins to melt, but this is not considered by Gelbke to be detrimental to health, as generally believed. Peters,⁴¹ takes the same view. Relative and absolute humidity are low throughout the year.

The sewerage and drainage of the place are good, all excreta being carried off by a sewerage system which discharges into the mountain-stream flowing down the valley. A narrow-gauge railway has been built from Landquart, in the Rhine Valley, and is nearly completed to Davos. This is considered by the writer to be not altogether beneficial to the latter place as a health-resort, on account of the large volumes of smoke which will be added to the atmosphere as direct and indirect consequences of the railroad connection. The suppression of the dust nuisance is also a problem not entirely solved. While much is being done to minimize the danger from the sputa of consumptives, the disinfection of this carrier of contagion is not entirely satisfactory. The cost of living varies from 6 to 12 francs per day.

At 11 P.M. the lobbies and reception-rooms in the hotels are closed. Dancing is not permitted, but many opportunities for dissipation are found in theatres, concerts, restaurants, climbing and coasting parties.

There are also several closed sanatoria in Davos where patients are received and treated according to the methods of Dettweiler and Bremer. A most valuable innovation in health-resorts is the establishment of schools where children with a tuberculous predisposition may receive their education and, at the same time, preserve or improve their health. Two such schools are in successful existence at Davos.

Les Avants, in the French Alps, is recommended by F. Penzoldt,⁸⁴ and D. J. Leech⁹⁰ as a winter health-resort. The elevation of the place is about 1000 metres above sea-level, somewhat higher than Montreux. It is well protected against harsh winds. Clear days are the rule in winter. The temperature is not so low as at Davos. In 1888 the minimum at Les Avants was 14° C. (57° F.), while at Davos it was 24.5° C. (76° F.).

A. Hoessli²¹⁴ recommends very highly the winter climate of

St. Moritz and other high stations in the Alps in wasting diseases of children. He cites cases of "general weakness," anæmia, post-scarlatinal dropsy, rachitis, heart disease, and similar affections, which disappeared or were greatly improved by a winter residence at St. Moritz. The effects especially noticed were improved digestion, increase in force of pulse, sedation of the nervous system, and a general tonic influence upon the system.

Arthur Foxwell¹¹⁸ writes of Arosa as a possible future rival to Davos. The mean temperature of the winter months is a little lower than at Davos; the clear days about the same; snowy days fewer, and days when the *föhn* blows somewhat fewer also. The amount of possible sunshine is greater than at Davos, being about the same as at Maloggia.

Algiers and Egypt are written about as health-resorts by A. A. Gore,¹¹⁹ J. Burdon Sanderson,¹²⁰ F. M. Sandwith,¹²¹ and a correspondent of the *Medical Press and Circular*. Mar. 28, Apr. 19, May 21, July 20, Aug. 20²² The favorable opinion expressed by others seems to be here sustained. Burdon Sanderson's paper is terse and practical. He concludes as follows: "If you want merely to be 'pulled together' or 'braced up' after an illness, at a time of year when the climate of England forbids out-of-door life, then go to the Riviera, to Corsica, or to Italy, rather than to Egypt. If you want, above all, rest of body and mind, absolute immunity from cold winds and inclement weather, and unlimited sunshine, you will find what you desire in the valley of the Nile. Make your home for the exploration of the former at the pyramids; for the latter, on a dahabiye; or, if that is unattainable, on a postal steamer, spending as few nights as possible in hotels."

Algiers has often been accused of having an excessive relative humidity, and, in consequence, being an unfavorable resort for consumptives. Gandil¹²² combats this view successfully by producing the official psychrometrical tables of the meteorological station in Algiers. The mean relative humidity for the six years 1884 to 1889 is 66 per cent. The greatest mean monthly range occurs in October and November, being 20.5 and 28.8 per cent., respectively. The mean annual range is 6 per cent. and the mean monthly range 8.3 per cent. Gandil, therefore, reiterates the opinion, expressed in a former work, that Algiers has an exceptionally favorable climate in pulmonary phthisis, especially in the early stages.

II. BALNEOLOGY.

During the past year or two considerable attention has been attracted to a pretended "new method" of hydrotherapy advocated by a Catholic village priest in the hamlet of Woerishofen, in Bavaria. The name of this new leader of what promises to become a "school" is Father Sebastian Kneipp. He terms his method a "natural method," which he developed in the course of a number of years. Several recent papers^{113 84 85} give a good account of the man and his methods, and a critical examination of the results obtained by him. The "cure" consists principally in a modified hydrotherapy, the most essential feature of which is that the water must be cold and the clothing put on without drying or rubbing the bathed part. The use of immersion-baths for the entire body seems to be limited to diseases accompanied by high temperature; hence rarely used, as most of his patients are chronic cases. Wet packings of the head, chest, back, abdomen, and extremities are frequent forms of using the water. After the bath the clothing is put on without drying the skin, and then a brisk walk is taken *in bare feet*, in the dew-covered grass, upon a wet pavement, or in the snow. The latter is for the purpose of hardening the body against colds. A very large *clientèle* visits Father Kneipp constantly, of whom many return to their homes cured or improved. Doubtless a good many cures do follow in cases of functional or slight organic disorders, but there can be no doubt that many of those who claim to be cured merely deceive themselves. L. Löwenfeld, in one of the papers referred to, shows, from the statistics given by Kneipp's own friends, that the results in well-conducted hydro-therapeutic establishments under proper control are much more favorable than those obtained at Woerishofen. The "Kneipp cure" seems to be at present a popular fad in Germany, but the prospects are that it will soon die out.

Judson Daland has written a summary of the mineral springs of the United States, classifying them according (partly) to their therapeutic effects. He divides the analyzed waters of the United States into seven classes as follows:—

I. *Diuretic Waters*.—Chief among these are: Bedford Sweet, Poland Summit, Berkeley, Capon, Cresson, and Bedford Chalybeate.

II. *Iron Waters*.—Churchill Alum, Bath Alum, Cresson

Alum, Sharon, Schuyler, Almaden, Vichy, and Thorp's Spring. The two latter are also aperient.

III. *Carbonic-Acid Waters*.—Sweet, Chysmic, Giesshübler (Bohemia), Summit, Apollinaris (Prussia).

IV. *Purgative Waters*.—Crab-Orchard, Pagassa, Louisville Artesian, Saratoga (Congress, Hathorn).

V. *Alkaline Waters*.—Saratoga Vichy, Vichy (Grande Grille and Hôpital), Ojo Caliente.

VI. *Saline Waters*.—Halleck, Akesion, Salt Spring (Mo.), Wiesbaden (Germany).

VII. *Calcareous Waters*.—Catoosa, Fate, Epsom.

VIII. *Sulphuretted and Hot Springs*.—Alpena, Sharon Sulphur, Hagers, Las Vegas (hot), Hot Springs (Ark.), Hot Springs (Va.).

A large number of mineral springs are as yet unanalyzed, and cannot, therefore, be properly classified. The special waters mentioned are only to be regarded as types of the classes; many others could be given that would represent the special types as well.

Professor E. Ludwig¹⁶⁰ describes a new process for obtaining the salts of mineral springs, taking as an example the new establishment for producing the salts of the Ferdinand Spring, in Marienbad. This salt is obtained in a pulverized condition, and contains all the constituents of the Marienbad water in their natural condition,—a result unattainable in the crystalline salts. The mean of a number of analyses is as follows:—

Sodium sulphate,	:	:	:	:	:	54.88 per cent.
Sodium chloride,	:	:	:	:	:	20.40 "
Sodium bicarbonate,	:	:	:	:	:	23.81 "
Lithium carbonate,	:	:	:	:	:	0.08 "
Potassium sulphate,	:	:	:	:	:	0.66 "
Water,	.	.	.	.	.	0.67 "

Also traces of sodium borate, sodium nitrate, sodium bromide, silicylic acid, and iron oxide. This corresponds very closely to the proportions of the various constituents in the natural water.

Arthur Loebel¹⁶¹, has experimentally tested the efficacy of the "extracts" or salts used in solution as a substitute for the moor-baths so popular in many European bath-resorts. The resident physicians at the various baths decry the use of the extract-baths, which can be taken at the patient's own home, and advance various reasons why the moor-baths, taken at the springs, should

be more efficient. Loebel's observations, supported by those of E. Pins,⁸⁴ seem to show that the artificial baths are equally as effective as the natural moor-baths.

J. Sterk,¹¹³ who has had many years' experience in Marienbad, shows that in many cases large doses of the sulphate-of-soda waters fail of effect in habitual constipation, when small doses are effective. He devotes considerable space to an explanation of the theoretical reasons for this action, none of which are conclusive. The practical fact of value is that frequently a small dose of a mineral water—a wineglassful or two—has a greater therapeutic effect than a large quantity of the same.

A. Baraduc,¹⁷ recommends highly the waters of Chatel-Guyon in constipation depending upon various causes. An experience of nearly twenty years has given him opportunity of observing the favorable effects of the waters in numerous cases in which constipation was a prominent symptom.

H. Keller¹⁵³ has studied anew the question of the absorption by the skin during the bath. He sums up the results obtained in the following two conclusions: 1. The healthy and unbroken human integument does not absorb in the bath. 2. The increase of chlorides in the urine after saline baths is not due to absorption by the skin.

Victor Audhoui,¹⁷ who is an authority on hydrology, writes that July is the best month for a visit to the springs, Vichy being had especially in mind. From June to August comprises the best and most favorable part of the season. This is combated by Durand-Fardel,²⁴ and in a humorous way by the editor of *Journal de Médecine*, who regard the limitation established by Audhoui as absurd.

A. Laranza⁵⁵ reports 15 cases of sciatica treated successfully at the mineral springs of Dax. The internal use of the water was combined with the external use of mud-baths.

Buchanan²¹⁸ gives an interesting account of Brides-les-Bains as a health- and bath- resort. Its altitude above sea-level is 1800 feet. The Savoy Alps are within easy reach to excursionists. Four to 500 persons can be accommodated at the various hotels and pensions. The life is simple and calmative. The waters are alkaline, slightly sparkling, and at their issuance of a temperature of 95° F. (35° C.). They are serviceable in digestive disorders, hepatic derangements, and constipation.

G. Herschell²⁵ discusses the proper use of purgative bitter waters at home. He uses exclusively "Franz-Josef," which comes from Buda-Pesth. This water contains 190 grains (12.31 grammes) of magnesium sulphate and 178 grains (11.53 grammes) of sodium sulphate to the pound. With proper regulation of the diet and regimen, the prolonged use of a purgative water is beneficial in chronic bronchitis and asthma, chlorosis, anaemia, lithæmia, biliary dyspepsia, gout, congestion of the prostate and of pelvic viscera. The water is taken, diluted with *hot* water, before breakfast.

Tatzmansdorf is a health-resort and mineral-springs establishment in Western Hungary.⁶ The waters are alkaline-chalybeate, with a large proportion of sodium bicarbonate. The bathing arrangements are very complete, and all baths must be taken under medical direction. Mud-baths are also given, as at Marienbad and Franzensbad.

W. W. Westcott⁶ has a short account of the arsenical waters of Levico. There are two waters, the mild and the strong. The former contains 8 grains (0.52 gramme) of iron and $\frac{1}{12}$ grain (0.00054 gramme) of arsenic per pint and the strong 34 grains (2.2 grammes) of iron and $\frac{1}{12}$ grain (0.0054 gramme) of arsenic per pint (500 grammes). It is recommended in doses of 1 to 2 tablespoonfuls after meals in anaemia, chlorosis, general debility, chronic cutaneous affections, uterine troubles, etc. The combination is rare; Bourboule has arsenic, but no iron; while Royat has only traces of either.

L. Blanc⁵⁹ describes the baths of Aix-les-Bains and Marlioz, in France. The arrangements for giving the various forms of bath are very complete. The water is sulphurous, and issues forth at a temperature of 112° to 116° F. (44.4° to 46.7° C.). The diseases most successfully treated are rheumatism and gout and their local modifications, syphilis, skin diseases, and various nervous complaints. The season lasts from May until November. Marlioz, only half a mile from Aix-les-Bains, possesses springs of sulphur-iodine-bromine water, which are useful in similar diseases.

The therapeutic virtues of the Hunyadi János water are said to be duplicated in a water from a Colorado mineral spring. The water contains over 900 grains (58.32 grammes) of salts to the gallon, of which 400 grains (25.92 grammes) are sulphate of magnesium, 180 grains (11.66 grammes) sulphate of sodium, and 67

grains (4.34 grammes) sulphate of potassium. As a laxative water it should take rank with some of the favorite foreign bitter waters

W. C. Dabney⁴⁰ has a brief paper on the sulphur-water of Greenbrier White Sulphur Springs, in West Virginia. The therapeutic effects are most marked in gout, chronic rheumatism, chronic malarial poisoning, lead poisoning, chronic duodenal catarrh, and generally in nervous depression from overwork.

L. Baret¹⁵³ gives a readable account of the mineral springs of Arima, in Japan. Arima is a thermal station, 51 kilometres from Kôbê. The journey is best made in a *djûriksha* (rickshaw). The route is picturesque, and the village of Arima, where the springs are found, comfortably supplied for travelers and health-seekers, although primitive in its arrangements from a European point of view. The waters are saline and chalybeate, the hot springs having a temperature of 41° C. (105.8° F.). The Japanese use the baths in rheumatic, lymphatic, and scrofulous affections especially, chronic glandular swellings, cutaneous scrofulides, lesions of the bones and joints, chronic inflammations of the conjunctivæ and nasal mucous membranes, and similar morbid conditions.

HYGIENE AND EPIDEMIOLOGY.

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HYGIENE.

GENERAL CONSIDERATIONS.

THE year has been marked by considerable activity in the framing and enforcement of general health laws and by numerous sanitary conventions. In the United States the passage of the Inter-State Quarantine Act marks a new era in the sanito-legal history of the country, enabling the government to prevent the spread of cholera, yellow fever, small-pox, or plague, all previous national legislation being distinctively in *aid* of health laws promulgated by States or municipalities. Measures have also been taken to prevent the introduction of leprosy into the United States from abroad; and the inspection of immigrants, heretofore imposed on the State authorities, has also been assumed at New York by the general government. Great attention has been paid by State boards of health to the causes, and particularly to the prevention, of contagious diseases, especially diphtheria and scarlet fever. Numerous municipal State laws are now in force compelling notification of these diseases. Perhaps the statute which could be taken most appropriately as a model is that passed by the Congress of the United States for the District of Columbia, providing for the notification, placarding, and restriction of intercourse in the event of these diseases. The only important omission in this law is the failure to distinctly establish a contagious-disease hospital for the class mentioned in the act.

G. H. M. Rowe,⁹⁹ believes that the powers given under the laws are too often permissive and not obligatory; that while the word "shall" is frequent, the potential "may" occurs too frequently, and in many cases no penalty is provided. He asserts that there is still

too much indifference with regard to diphtheria and scarlet fever, and shows that when accommodations are provided for the treatment of these contagious diseases the people will seek them. One difficulty in connection with the compulsory treatment of these diseases in hospital is in the want of legal power to retain the patient in hospital when once admitted. The laws should be so extended that hospital authorities having contagious cases under their charge should possess the same powers as a board of health.

Alfred Hill,¹⁵⁹ stated to the British Medical Association that a glance at the death-rates of Great Britain generally, of the aggregated 20 largest English towns, or of the few principal towns individually, proves that in the seventeen years prior to 1889 there had been a great improvement in public health. In the whole of England and Wales the diminution is from 21.2 to 17.9 per 1000 of the population; in the 20 largest towns, from 24.4 to 19 per 1000; while, taking certain individual communities, it is seen that in London the death-rate has fallen from 22.5 to 17.4; in Liverpool, from 25.9 to 21.6; in Birmingham, from 24.8 to 18.4; in Manchester, from 30.1 to 26.7; in Salford, from 29.3 to 20.5; in Leeds, from 27.6 to 22.1; in Bristol, from 23.1 to 17.6; in Norwich, from 21.5 to 18.4; in Maidstone, from 22.8 to 13.7. At the beginning of the present year the compulsory infectious diseases (notification) act was adopted in Birmingham, as in most other places; and, according to Hill, the operation of the law has been smooth and gratifying.

Edward Seaton,² calls attention to the necessity for clinical instruction at hospitals set apart for infectious diseases.

The Royal College of Physicians has drawn up a scheme for medical instruction in the rate-supported fever hospitals of the metropolis, by which students will be taught the diagnostic signs of those diseases.

An Australian editorial²⁵⁵ calls attention to necessity for isolation, in addition to notification, which has been compulsory in Australia since December, 1888. The health act provides for the establishment of infectious-disease hospitals by the municipalities, but so far its provisions have only been applied in the case of typhoid fever, and then by arrangement with the general hospitals.

Status of Sanitary Affairs in Certain Countries.—Public hygiene in Vienna is supervised by a Council of Hygiene,^{1094a}

medical bureau, composed of a chief physician, his coadjutor, thirteen district physicians, and two assistants.

The chief sanitary officer of Belgium is the Minister of the Interior. He is assisted by a Superior Council of Public Hygiene, established in 1879 and modified in 1883. It consists of two physicians, a veterinary surgeon, three chemists, an engineer, an architect, and four public functionaries, holding government appointments. This council is not a permanent medical commission, but a consultative body. Another consultative body is the Royal Academy of Medicine. Besides these advisory bodies, there is a provincial medical commission for each province.

England possesses a complete and satisfactory sanitary code. Its principal provisions emanate from Parliament, and are respected and strictly observed. The direction of public hygiene in England belongs to the Local Government Board and the Local Board of Health. The former consists of a president appointed by the Queen, the president of the Council of State, the Keeper of the Great Seal, the Chancellor of the Exchequer, one of the secretaries of Parliament, and a secretary-general. The Local Government Board comprises nine distinct departments: (1) Public Aid, (2) Judicial Questions, (3) Sanitary Architecture, (4) Sanitary Engineering, (5) Medical and Hygienic Considerations, (6) Vaccination, (7) Hygiene of Factories, (8) London Water-Supply, (9) Statistics.

There ^{are} ~~are~~ in Egypt two sanitary authorities, differing in their constitutions and functions and acting independently of each other. The International Board of Quarantine is a semi-political institution, the members of which, though paid by the Egyptian government, are appointed by the several European States which they represent. Their duties consist in reporting to their respective governments the presence and progress of cholera in India and other countries, and advising on the quarantine and other measures deemed expedient for the purpose of averting its invasion should it appear in the neighborhood of the Red Sea. The other, the *Direction Sanitaire*, or Egyptian Board of Health, is supposed to concern itself with the sanitary condition of the country.

The Minister of the Interior is the first officer of the service of public hygiene in France. He is aided by a consulting commission, who advise the minister in regard to: 1. Quarantines and their

organization. 2. Measures for the prevention of epidemics and for the amelioration of the condition of manufacturing and farming population. 3. Vaccination. 4. The improvement of establishments at mineral springs and the means of rendering them accessible to the sick poor. 5. The institution and organization of health commissions. 6. Medical and pharmaceutical police. 7. Hygiene of workshops and factories. 8. Questions concerning laboratories in cities and departments.

The Chancellor of the German Empire has the chief direction of public hygiene. Second to him is an Imperial Board of Health, composed of a director, four members, eight medical coadjutors, and a chemist. The Board of Health comprises also twenty-five members extraordinary, chosen from different parts of the Empire, physicians, engineers, architects, pharmacists, or veterinary surgeons. The governor of each province is charged with the management of public hygiene. He is assisted by a provincial council, which does not include a physician. Each province is divided into several districts, which have each a president, assisted by a council, one member of which must be a medical councillor. This functionary is ordinarily an old district physician. Each district is subdivided into smaller districts, each having its hygienic medical officer, assisted by a surgeon. The Surgeon-General of the German army is in fact the Chief of Public Hygiene in the German empire, for it is under his direction that the local authorities carry out the Imperial sanitary orders.

Albert S. Ashmead, of Tokio,⁵⁹ calls attention to the following sanitary needs of Japan: 1. The supply of pure drinking-water through impervious pipes in Tokio, and the prevention of its contamination from public urinals and night filth. 2. Medical supervision of its fish-supply. 3. Other disposition of its night filth than its carriage in buckets on men's shoulders through the streets in day-time to open boats moored in the canals, to be scattered broadcast over the rice-fields, with consequent poisoning of springs and drinking-wells in the country. 4. A mode of conveyance other than the man-carriage, or "jinrickisha," thousands of which are used in Tokio alone, with resulting heart disease to the poor men who earn a livelihood by running them. 5. Medical supervision of public hot baths to separate the diseased from the well, and for the more frequent renewal of the supply of water.

The abolishment of the insidious charcoal stove, with its resulting poisoning by inhalation of carbonic-acid gas. 6. Sanitary inspection of the sinking of wells for drinking-water in the crowded parts of the city through a soil reeking with population filth. 7. The filling up of the old central castle-moats in Tokio, 60 miles in extent, now but swamp pools of malaria infection and decaying lotus débris.

Ogston⁵⁵⁷ says the excellent laws possessed by New Zealand for the regulation of public health are in some respects in advance of those that lately prevailed in Great Britain; but he points out that in all but two instances the provisions of the law have been made merely permissive, and not compulsory. Hence, New Zealand, like her sister colonies of Australia, sees diseases like typhoid fever and diphtheria playing havoc year by year, unchecked.

The rate of mortality¹⁰⁰⁴ is lower in the United Kingdom of Sweden and Norway than in any other European country, being 17.2 to 1000 inhabitants. Since 1874 Sweden has had a sanitary code which has been faithfully observed. There is a medical council composed of a director-general and four members. One of these is surgeon-general of the army.

The direction of hygiene at Helsingfors, Finland, belongs to a commission composed of a physician of the city, the chief of police, and city engineer, and five delegates elected every two years.

LIGHT.

The relative merit of gas and electric light is discussed by von Pettenkofer, of Munich,⁴¹ who believes that the electric light, especially the arc-light, has an advantage over gas-light. In the production of heat the difference is 1 to 20. Deterioration of air is entirely absent in electric light, but considerable in gas, which also presents the great danger of poisoning and explosion.

The officially-recorded deaths from electric lighting in all parts of the United States during the nine years past⁶ have numbered 116. Fallen wires, faulty insulation, inadequate supervision are the chief causes of accidents, all of which are deemed preventable.

Philip Coombs Knapp⁹⁹ gives the following conclusions upon accidents from the electrical current:—

“ 1. Currents of high potential may produce no permanent

effect upon the human organism, may cause severe burns without other effects, or may give rise to nervous symptoms of various kinds, similar to those seen after other injuries,—the so-called ‘traumatic neuroses.’

“2. Currents of high potential may prove immediately fatal, or may give rise to burns which later cause death.

“3. The limit of safety from death or injury from currents of high potential has not yet been determined, and is probably variable.

“4. The alternating current is probably more dangerous than a continuous current of equal electro-motive force.”

Charles L. Dana, of New York,¹⁰, states that the severer the surgical injury, the less danger is there of a severe neurosis being established, and that in rare cases the electric current passing through the body produces disorganization of the nervous or nerve-centres, causing a condition like that of myelitis or multiple neuritis. George Westinghouse, Jr.,¹⁵⁰ suggests the following measures of safety: (1) an absolute electrical separation of the street-mains from the wires in all buildings; (2) the reduction of pressure of the current to 50 volts within all buildings; (3) the limitation of the quantity of current carried by street-mains; (4) the running of each pair directly from the station without interconnection in the streets, thus securing the highest degree of safety, irrespective of the economical advantages, which are neither few nor unimportant.

A. Van Hoff Gosweiler, of Baltimore,⁵⁰ calls attention to a disease known as “electric prostration,” resulting from exposure to the arc-light, affecting the subject’s throat, face, and eyes, the only remedy for which is by the wearing of a shade over the eyes. Cases of acute conjunctivitis and retinitis are cited; but in general the Edison lamp is considered a valuable and safe light.

HEATING AND VENTILATION.

The danger from the use of portable stoves being discussed before the Academy of Medicine of Paris (report of de Pietra Santa, corresponding editor), the question of governmental supervision became one of the issues, and its partisans gained their cause. In the course of the discussion Brouardel stated that the renewal of the air in a room, or of vehicles, is not a sufficient safe-

guard, and that he had made autopsies yearly on four or five individuals poisoned by sleeping in the open air at the blast-furnaces in the environs of Paris, or where their mouths were near to fissures from which there was an escape of carbonic oxide. Armand Gautier asserted that 5 millimetres of carbonic oxide in the surrounding atmosphere provoked poisoning in one-eighth of the total blood. According to Laborde, the presence in the atmosphere of carbonic oxide in the proportion of 1 to 650 is injurious to life. Resolutions were adopted prohibiting the use of economic heating apparatus of feeble draught in sleeping-rooms and apartments adjoining the same, as well as the use of portable stoves in general, and giving precautions that should be taken in their use.

Samuel G. Dixon¹¹² calls attention to an apparatus for the chemical and mechanical cleansing of air in the chamber of a hot-air furnace, and proposes to convert some of the irritating and noxious gases into the salts of calcium sulphite, calcium sulphate, and calcium carbonate and water, and also to remove much of the dust from the air before it is admitted into the hot-air flues. To accomplish this the gases must be brought into contact with the calcium hydrate. This is accomplished by means of a roller of cheese-cloth (cotton gauze) continually wetted with calcium hydrate stretched across the aperture connecting the ordinary hot-air chamber, with a special air-chamber above. The saturated cheese-cloth, being perforated and doubled, and the holes in the cheese-cloth through which the air passes from the lower to the upper chamber alternating, the air in ascending either impinges on the lower or upper stretch of the cloth wetted with calcium hydrate, breaking up the lime-water and the sulphurous gases and the carbon dioxide. The damp cloth also retains much of the dust and many of the micro-organisms out of the air, which, ascending into the upper chamber, is purified and cleansed.

With regard to fire-places, which will always be popular, the writer of a prize essay¹¹¹ states that the main drawback is the difficulty of renewing the fresh air in the room to replace that carried up by the chimney, without causing some draughts of air. Galton's chimney was originally constructed to obviate this difficulty. The false back in this grate permits of the delivering into the room of about the same amount of fresh, warmed air that escapes by the chimney. With the same amount of fuel, about

30 per cent. more of heat is given by this chimney than with the ordinary one.

Steam-heating is regarded as superior to heating by stoves and furnaces, but has its drawbacks in the fact that the temperature of the radiators must always be that of steam, and that a vigorous fire must always be kept up so long as any heat is needed. The hot-water system is regarded as the system *par excellence* as furnishing a more constant and milder temperature, with less fire and care than is possible with any other mode. In order to have a comfortable and healthy room, we must harmonize the workings of the heating apparatus with that of the ventilating system, and both of these to the size of the room in relation to the number of its inmates.

Astonishing results in ventilation are obtained by burning a gas-jet in a chimney-shaft. Morin says that with 7 cubic feet of gas burned per hour, in a flue 11 inches square and 66 feet high, 13,300 cubic feet of air will be drawn from the room.

At the annual meeting of the American Public Health Association, held in Charleston, in December, 1890, a demonstration was given of the value of the new ventilation railroad-car. During the movement of the train, all windows and doors of the car being closed, by means of an apparatus attached to the car-axles, fresh air is forced (but subject to control) into the car on a level with the seats, while the air from the top of the car is removed by suction. In fifteen minutes this car, filled with the fumes of tobacco from fifty smokers, was almost freed from all smoke, though the smoking was continued, and no draught of air was perceptible.

Experiments have been made, in transit, by Faratkevitch, of St. Petersburg, with the psychrometer and thermometer, every four or six hours. He found the atmosphere in the first-class cars to contain 0.37 more carbonic acid than normal. In the inferior cars the proportion was considerably greater. Neither the temperature nor the degree of humidity was normal. The air should be renewed five times in an hour.

Nicaise¹⁰ refers to Raulin's suggestion, made in 1752, that tuberculous patients should live in rooms with the windows kept open. He experimented for several months on the temperature of the external air and that of a room with the window constantly opened to the southeast. He ascertained from minimal tempera-

ture readings, taken each day, that the temperature of the room oscillated between 10° and 14° C. (18° and 25° F.).

D. P. Menzies, a ventilation engineer of Glasgow, has patented a ventilator consisting of a conical metal ventilator placed upon the roof-ridge, and having beneath it an apparatus by which down-draughts are rendered impossible and perfect ventilation is secured. This is done by means of an arrangement of valves so sensitive that the slightest draught down will close them. Within the roof is a pipe leading down from the ventilator, and in this is a steam-coil, and beneath it a gas-burner which can be ignited by electricity. When the burner is lighted the heat from it raises steam in the coil, which, becoming super-heated in a second coil, creates a very powerful up-draught, which can be put off or on at pleasure, irrespective of weather.

Richard Stein¹³¹ found that in the quiet air of a chamber the particles containing bacteria fall to the ground. The air will in one or two hours be completely free of germs. If the floor be then washed with an antiseptic solution and the furniture and similar articles wiped with a cloth wrung out in it, the chamber can be considered as disinfected. Ventilation by the renewal four times an hour of the air contained in a chamber has no special influence on the removal of germs floating in the air; only in a strong draught is a quick and complete removal of germs from the air to be obtained. The use of a spray appears to have no effect. The practice of hanging up infected clothes and bedding in the air is useless unless they are at the same time beaten and brushed; for even under strong draught neither the floor, carpets, nor furniture were purified.

Cordier's ventilating apparatus¹⁵⁸ consists of two iron boxes and a battery of tubes. The lower box is placed immediately behind the combustibles in a grate. The tubes are fixed to the lower and open into the upper box. A pipe conducts the heat from the upper box into the room. A tube communicating between the lower box and the outside of the house supplies a current of fresh air. This should be the only channel to supply outside air, and the doors and windows of the room should be closed. It has been demonstrated by experiment that, with the aërating apparatus in full operation, 10 kilogrammes (25 pounds) of coke were consumed in twenty-four hours, and the atmosphere of a

room with a capacity of 100 cubic centimetres was completely renewed every two hours.

SOIL.

Charles N. Dowd, of New York,⁵⁹ gives the result of a series of experiments to determine the relative number of bacteria in soil permeated with gas and soil poison. The number of bacteria per cubic centimetre found in gaseous earth averaged 37,243, specimens of earth being taken from sixteen different localities. The number of bacteria in non-gaseous earth taken from sixteen other localities averaged 39,873 per cubic centimetre, and he states, therefore, that practically there is no difference in the number of bacteria in gaseous and non-gaseous earth. He also found, from further experiments, that the gas has no influence on bacteria in the earth in experimental tubes. A. Palmburg¹⁵³ believes that the earth plays a very important part in the propagation of contagious diseases. Soil best adapted to the propagation of malaria consists of permeable strata impregnated with the products of decomposition. It is at its maximum when there exists an underlying body of subterranean water with a variable level. The upper layers of soil, left dry by the retreating water, allow the bacteria to escape into the atmosphere, whence they pass into the organism. When the subterranean water-level is high the microbes cannot escape from the soil, and hence infection cannot be produced.

WATER.

C. W. Chancellor¹⁵⁰ gives the different methods of the purification of water-supplies as follows: 1. By the exclusion of organic filth. 2. By the use of alum. 3. By filtration through charcoal. 4. By filtration through sand and gravel. He reiterates the belief that all manufactories and trades should be required to clean their own waste; that is, to deprive it of its power to become a nuisance when discharged into a public water-way. Speaking of the second method he refers to the experiments of Jennet in 1865, proving that 2.3 grains (0.16 grammes) of alum to a gallon of water renders it drinkable, even when full of foreign matter; and states that Austin, of Rutgers College, New Jersey, has found this amount of alum unnecessarily high, and that 1.2 grains (0.07 grammes) is about as small an amount as is practicable for obtaining a perfect separation of the impurities in New Brunswick hydrant-

water. Chancellor says that no house-filter should be used continuously for a longer period than two or three days without draining off the contained water and allowing the air, which is more destructive of organic matter than water, to pass through the filtering material for several hours. Recent experiments indicate that the sand-filter beds can be cleaned if a reverse current of water is made to pass through them with sufficient force. The "National Filter" is a good type of this class.

W. Migula² believes that there is no reliable guide in examinations for the ordinary saprophytic organisms of drinking-water. In his experiments it is assumed that if any of the organisms multiply they will all do so, whilst if the putrefactive organisms (those that liquefy gelatin) grow more rapidly than the others independent evidence is obtained of the impurity of the water. After examining 400 springs, wells, and streams, the author concludes that when there are more than ten species in any sample of water, especially when these are not species ordinarily met with, the water should not be used for drinking purposes. Putrefactive bacteria are almost invariably absent from spring-water. They are most frequently found where the number of species is great, and where the number of colonies is between 1000 and 10,000 per cubic centimetre. They also occur where the number of germs is below 50 per cubic centimetre, but very seldom when the number is over 10,000.

The influence of sand-filters on the waters of Zurich and Berlin is considered by Bertschinger,¹²⁷ who states that sand filtration purifies the water of the lake at Zurich, ordinarily causing a freedom from germs; yet some time after filtration the water will contain a small number of bacteria. The swiftness of filtration, at least within the limits of 3 to 12 metres a day, has no influence on the character of the water. C. Fraenkel, however, has demonstrated that there is some dependence on the rapidity of filtration, the number of micro-organisms increasing when the filtration is rapid. With a small filter of sand, similar to the large ones used at Berlin, he showed that at the beginning and end of the experiment the organisms are most increased in the filtered water,—at the beginning because the filter does not act efficiently, and at the end because the pressure is considerable, and perhaps because the bacteria are reproduced in the filter during the experiment.

Carl Fraenkel and C. Pieske⁵⁸, made experiments to determine the efficiency of sand filtration. During an epidemic of typhoid fever in Berlin, in 1889, the districts most severely affected were supplied only with filtered Spree water; the district spared, only by the Tegeler Lake water. At the water-works at Stralau, where the Spree water is filtered, out of the 11 filter-basins, 8 of them are open, and are often frozen over, thus rendering it impossible to clean them, perhaps, for two or three months, whereas they should be cleaned once in four weeks. The Spree water, therefore, which is very impure, has often to be filtered through the three covered filters, which in consequence are overstrained, and the water has to be pushed through at a high speed. Moreover, the open filters which stood in need of cleaning were used in February as long as they would pass water, and the bacterial scum which gathers on top of the water, opposing and constantly increasing the resistance to the passage of the water, caused an increase of pressure with the effect of forcing bacteria through the pores of the filter. This was proven by bacteriological examinations. Thus, in March, the water forced through a filter which should have been cleaned in January gave 4,000 colonies to the cubic centimetre as against 100 in January. At the same time the Spree water was very impure, giving, from the middle of January to the middle of March, as many as 100,000 colonies to the cubic centimetre. Apparently, then, in the conditions of filtration were to be found the explanation of the outbreak of typhoid fever, and the question arose whether sand-filters are capable of keeping back all the micro-organisms present in purified water, as has been heretofore claimed. Experimental sand-filters were therefore prepared to determine their action upon definite micro-organisms, the experiment being made with the bacillus violaceus, and, however the conditions were varied, it was found that this bacillus passed through the filter at all periods. At the commencement of filtration it passed through readily and abundantly. When time had been given for a bacterial scum to form, it passed through sparingly, but in quantities depending on the speed of filtration. The value of the filtration is in inverse ratio to the speed. Again, at the end, when the bacterial scum was so thick as to require a high pressure for filtration, the bacillus violaceus passed through more abundantly, and exactly the same

results were obtained when the bacilli of typhoid fever and cholera were added to the unfiltered water. These experiments show conclusively, therefore, that filtration through sand of impure river-water, though it may reduce the danger of infection, especially when at a low speed, by no means at any times removes it, and that the danger is greatest just after and just before cleaning the filters.

Alterhoefer⁵⁰,₅₁ finds that the addition of H_2O_2 in proportion of 1 to 1000 to drinking-water containing sewage, or to water containing typhoid bacillus or cholera bacillus, is quite sufficient to destroy the various saprophytic and pathogenic organisms, if the H_2O_2 is obtained perfectly fresh, kept in good condition, and allowed to act for a period of twenty-four hours.

Before the Franklin Institute of Philadelphia, Austin Devonshire¹⁵⁰,₁₅₁ described a filtering process used at Antwerp, Belgium, as long ago as 1879, by means of spongy iron, produced by heating hematite ore to a temperature a little below that of fusion, thus rendering it porous or spongy in form. The chemical results, and the great improvement in the appearance of the water seemed to indicate that a practical process of purifying foul water on a large scale had been discovered; but after a few years it was found that the mass of spongy iron mixture was caking and becoming daily less porous. William Anderson then devised an apparatus known as the revolver-purifier. Instead of allowing the water to flow through a motionless mass of the purifying material, Anderson adopted the principle of showering down finely-divided particles through a flowing stream of water. It was found that contact of the water with the spongy-iron filters in the revolving purifier effected complete purification of the great majority of waters in from three and a half to five minutes.

An ordinary sand-filter will rapidly become foul throughout its entire depth; if water be forced through such a filter after a certain point of fullness has been reached, the filtered water will be worse than the unfiltered. With the iron process this is not the case. Purification is completed by the time the water reaches the sand. To prove this the sand-filters have been at work at Antwerp for more than five years and have never been cleaned beneath the surface.

The effect of freezing upon impurities contained in water

has been made the subject of experiments by the Massachusetts Board of Health.¹⁵⁹ In ice from polluted sources, compared with water from the same, the experiments showed: 1. That in the ice the color and salt had been removed. 2. That all but 13 per cent. of the other impurities of the water, as shown by chemical analysis, had been removed. 3. The number of bacteria in the cubic centimetre were, for snow (one sample), 1246; for clear ice, part of the same cake as above, 6; and for clear ice, from an unpolluted source, none. 4. The average of 12 samples from the most polluted sources, 138. The purifying effect of freezing is greater upon substances in solution than upon those in suspension. From the average of all the water and ice used for ice-supplies which the board examined, they found the organic impurities of snow-ice (the sum of the ammonias) equals 69 per cent. of the impurities of the water. The organic impurities of all the ice, except snow-ice, equals 12 per cent. of the impurities of the water. The organic impurities of clear ice equals 6 per cent. of the impurities of the water. The color of waters is removed by freezing. The conclusions are that, while clear ice from polluted sources may contain so small a percentage of the impurities of the source that it may not be regarded as injurious to the health, the snow-ice, and any other, however clear, which may have been obtained by flooding, is likely to contain so large a percentage of the impurities and disease-germs of the source that the board warns the public against using ice for domestic purposes that is obtained from a source polluted by sewage beyond that which would be allowable in drinking-water; and, in general, it is much safer to use for drinking-water, and for placing in contact with food, that portion of the ice that is clear.

Charles G. Courrier,⁵⁰ states that even the familiar employment of carbonic-acid gas does not render water from an impure source safe, unless the water has been adequately purified, which he thinks should be done by heating. He has observed that some kinds of bacteria increase to a certain degree in water charged with carbonic-acid gas, under a pressure of over 100 pounds to the square inch. His conclusions are that, unless extraordinarily resistant, water becomes sterilized if it be at or near the boiling temperature for fifteen minutes. If the same degree of heat be maintained for five minutes, all harmful micro-organisms will have been destroyed.

Still less time serves to destroy the disease-producing varieties which are recognized as liable to occur in water. Thus, merely raising to the boiling-point a clear water containing the micro-organisms of malarial disorders, typhoid, cholera, diphtheria, or of suppurative processes, and allowing it to gradually cool, insures the destruction of these germs. They are also destroyed by keeping the water for from a quarter of an hour to half an hour at a temperature of 70° C. (158° F.). Occasionally, resistant but harmless bacteria may invade water. The brief heating renders the water safe for drinking purposes, but, when it is desired to destroy every micro-organism present in a contaminated water, it should be heated for one hour and allowed to cool slowly. Then it may be used for cleansing wounds or for alkaloidal solutions, which will keep indefinitely if no germs be introduced after the solution has been treated.

Lead poisoning from drinking-water forms the subject of many communications. The British Medical Association, at its annual meeting in Birmingham, ² July 29th, 30th, 31st, August 1st, adopted a resolution recognizing the serious, wide-spread nature of lead poisoning from this source, and requesting the immediate intervention of the government. Percy Frankland ³ states that it is unquestionable that one and the same water-supply may have the power of acting upon lead at one time and being inactive at another. The examination of water for activity toward lead must be conducted with much circumspection. The water should be placed in a piece of lead service-pipe, closed at both ends, and after remaining for twenty-four hours the amount of lead in suspension and solution should be carefully determined. It should be remembered, also, that some waters act more upon new lead than upon old, while others act upon the old or corroded metal more than upon the bright, untarnished surface; therefore, the above test should be made with a new piece of service-pipe as well as with an old one. Of all methods of preventive treatment, Frankland states that by far the most efficacious is the addition of a certain proportion of carbonate of soda to the water. As regards the quantity, this must be ascertained by actual experiment, but in an extreme case he found it necessary to use 5 parts of soda to 100,000 parts of water by weight. He recommends, also, (1) that no water should be

collected for drinking purposes until after the tap has been allowed to run for such length of time as will presumably clear the service-pipe of its residual water; (2) that the filtration of the water through any form of enamel charcoal-filter guarantees its absolute freedom from lead; (3) that hot water acts with more power on lead than cold, and that, therefore, the use of metal teapots and other soldered vessels for holding hot water should be avoided as much as possible.

Theodore Thomson² states that the action of certain water on lead piping has been attributed to (1) the presence in abnormal amount of O or CO₂; (2) acidity of the water; (3) deficiency of silica; (4) the quality of the communication lead piping; (5) the agency, direct or indirect, of low forms of organic life. He believes that domestic filtration is bad in principle, and that the true indication is to so treat the water before delivery as to reduce its plumbo-solvent action within limits not detrimental to health. Among other plans, filtration of the water through beds of limestone, sandstone, or other suitable material is suggested, and a less expensive plan is to add to the water an agent which will sufficiently reduce the plumbo-solvent action. Such agents as carbonate of soda, caustic lime, and chalk have been suggested. At Sheffield chalk is now being added for this purpose to the high-level water. Since the introduction of this chalk treatment comparative tests have been made in certain localities, showing that the quantity of lead in solution has been found to be reduced one-third.

A special commissioner was appointed by the *British Medical Journal* to discover the cause of the Sheffield trouble, and many reports were made on the subject.

White³ expressed the belief that a blue line on the gums would be found in one-third of the population of Sheffield supplied with water from the Redmires reservoirs.

From numerous experiments, John Brown, of Bacup, Yorkshire,⁴ came to the conclusion that the chief agent in the solution of the lead was not the acids, but the oxygen. Thus, plumbism is far more frequent in winter, when the temperature of the moorland surface-water is not over 40° F. (4.5° C.), than in summer, when, having, unlike spring-water, the same temperature of the air, its power of holding gases in solution is less. Delivery under pressure, especially when uninterrupted, favors aération, and is followed

by lead poisoning. Lead occurs in water as a hydrate in solution and a carbonate in suspension. The presence of iron or of lime increases, while that of alkaline or earthy carbonates diminishes, its solvent power. Passed through carbon filters, which absorb sometimes as much as six-sevenths of the oxygen, moorland water ceases to act on lead.

Henry J. Barnes,⁹⁹ writing of the Boston water-supply, summarizes as follows: "1. Our water-supply is not satisfactory. 2. All sewage should be excluded. 3. Native aquatic life, both animal and vegetable, should not be disturbed in the basins. 4. The particles of organic matter which escape bacterial digestion, together with living organisms, should, as far as possible, be arrested by filtration. 5. With advantage the water might then be stored for short periods in covered reservoirs."

AIR.

According to Geo. Martin Kober,¹⁰⁰ 82 per cent. of the inhabitants of the United States breathe a mean annual temperature of 60° F. (15.55° C.) or under, 69 per cent. live in localities with a mean annual temperature of 55° F. (13° C.) or below, and 38 per cent. reside in portions of the country where the highest mean annual temperature is 50° F. (10° C.). Ninety-seven per cent. of the citizens of the United States are exposed to summer heats which have a range of 20° F. (11° C.) only, lying between the mean temperature for July of 65° F. (18.5° C.) and 85° F. (29.44° C.). The mean annual temperature of the United States is about 53° F. (11.5° C.). The regions ranging between 75° and 85° F. (23.88° and 29.44° C.), average July temperature, appear to include the yellow-fever districts. These statistics are taken from the government reports. Of the dust in the atmosphere, various authorities estimate that from 21 to 46 per cent. of it is organic, and attention is called to the fact that atmospheric dust may travel to great distances. Ehrenberg has shown that the air of Berlin has evidently contained organisms derived from the African deserts, and the sails of ships 600 to 800 miles from Africa are often quite red with the sand which lodges on them. Kober points out that if inorganic dust can travel such long distances there is no reason why disease-germs should not be wafted still greater distances, and thus, perhaps, explain the occurrence of certain epidemics in

localities which could not be traced to the contagion of a pre-existing case. As to organisms in the air, the number of bacteria varies greatly according to seasons, weather, locality, and altitudes. In a room of the Hotel Bellevue, near Thun, altitude 560 metres, Miguel found 600 germs per cubic metre; in the open air, 25 per cubic metre; on the lake, 8 per cubic metre; at an elevation of from 2000 to 4000 metres, none.

Geo. B. H. Swayze¹⁷⁶ calls attention to the dangers from home-made poison in our house-air. The combustion of carbon coal, coke, or charcoal (wood) sets free the carbonic-oxide gas in two forms, dioxide and monoxide, a portion of which, from lack of knowledge and neglect, is diffused through the house-air, either in day-time or at night, in almost every house where fuel is burned. In flush quantities the carbonic oxides or foul gases destroy life in a few minutes or hours; in small, diluted, gradual quantities, mixed with the house-air, they interfere with normal aëration of the blood, produce anæmia and debility, or imprison the air-vesicles by excluding oxygenation, as in croup and other dyspnœal embarrassments. As between bacteria and coal-gas, he admonishes to pay more attention to the coal-gas, and thereby prevent the septicity in which the bacillus is developed as a scavenger.

The abatement of the smoke nuisance forms the subject of a paper read at the annual meeting of the British Medical Association by Sidney Barwise, of Blackburn, in which he calls attention to the mechanical stokers, which are of two classes,—those that constantly throw small quantities of fuel on the fire at different distances from the front of the grate, and those that coke the fuel, the gases given off in the process of coking being burnt in passing over the clinker. Various patterns of mechanical stokers are described, and in conclusion the writer states that in cases of special difficulty it might be necessary to consult a specialist, but in all ordinary horizontal boilers the specification of coking mechanical stokers, with which the use of the rake is not required, would soon put an end to a nuisance which is a disgrace to our vaunted sanitary progress and civilization.

HOUSE-DRAINAGE AND SEWERAGE.

Samuel G. Dixon¹⁷⁷ gives a description of an apparatus for maintaining constant ventilation of the bowl of a water-closet.

This is done by means of a cone-shaped spray of water, the supply of water for this jet being taken from the water-supply pipe attached to the flush-tank of the closet. The spray forces the air ahead of it through a pipe which is connected with the top of the bowl, and which leads, in a U-shape, from the bowl to the outer air, the spray being located in this pipe. A constant current of air is thus produced from the bowl of the closet to the outside atmosphere.

A new system of sewer ventilation has been introduced by Wallace,⁶⁴⁵ which combines flushing and ventilation, the same quantity of water being first made to rotate a fan and produce a powerful suction of gases from a considerable length of sewer to the top of a vertical shaft, and subsequently to flush suddenly the same length of sewer. An apparatus on the basis of this model is in course of erection in Eastbourne, England.

W. F. Taylor¹⁰⁰⁰ states that the removal of excreta by water is the cleanest, most convenient, quickest, and cheapest method in all cases where a public water-supply exists. Separation of the sewage from the rain-fall should be effected as much as possible. The separate system offers advantages in places where the sewage has to be raised to a higher from a lower level. Pumping machinery, when the quantity is nearly uniform, can be easily regulated to meet all requirements; but Isaac Shone's system of pneumatic ejectors will in many cases answer for this purpose better than pumping. It consists in forcing the sewage by means of compressed air from iron tanks, termed ejectors. The ejectors are iron vessels of about 600 gallons capacity, having an inlet for the sewage, which flows into them by gravitation, and an outlet for the discharge. When the ejector is full the compressed air is admitted by an automatic arrangement which opens the valve of the air-pipe and shuts it again when the ejector is empty. The height to which sewage-water can be lifted by this means is practically unlimited. At Eastbourne there are seven pneumatic ejectors which are supplied with compressed air at one station, one ejector being about 2 miles from the station.

Another mode of disposal is the discharge at once into running water, which has been prohibited in Great Britain. The injury to rivers by turning sewage into them is of three kinds: (1) sediment which forms banks of mud; (2) destruction of fish (fish

will live in fresh sewage, but not in stale), and (3) emanations into the air of gases.

In the precipitation of sewage the solid part is precipitated before the liquid is allowed to pass into the stream or over the land. This may be done by subsidence, but usually some chemical precipitate is also used, such as lime, salts, albuminous substances, charcoal, alum, blood, clay, manganese, etc. Chiswick offers an example of the chemical treatment of sewage without any subsequent filtration through land, the affluent being sufficiently pure to admit of its discharge direct from the settling tanks into the river Thames, above London. Lime and alum are the chemicals used in the proportion of 11 grains (0.7 gramme) of the former to 7 grains (0.5 gramme) of the latter per gallon.

Broad irrigation means the application of a minimum quantity of sewage upon a maximum area of land, according to Edward Pritchard, by which, together with purification, we have also utilization, which enables the crops to be grown upon the land at the same time the sewage is treated and the land purified.

By proper attention to detail a sewage farm may be managed so as to be free from disagreeable odors and any danger to health.

Alfred Ludlow Carroll, of New York,⁶¹ asserts that cremation is the manifest destiny of house-refuse in all populated places. It means a rapid, innocuous, instead of a slow and possibly dangerous, process of oxidation. Aside from any actual pecuniary return, the economy of this plan of combustion, as compared with other methods of disposal, should commend it to every corporate government. In the Whitechapel district of London, where it formerly cost from half a dollar to a dollar a load to cart away to a distance the household refuse and "dust," all the contents of the East End bins are reduced to a harmless mass of clinker at about one-twelfth of the expense by means of a series of strong-draught furnaces, which consume all gases generated during the process.

A. Ernest Maylard²¹⁸ made experiments to test the relative value of waste-pipes used for drains, etc., in hospitals. Pipes of cast iron, of copper, of lead, and of brass, as well as solder, were immersed in solutions of bichloride of mercury of a strength of 1 in 100, the solution being changed each week. The lead and brass pipes were those most extensively attacked by the solution, each losing nearly 40 per cent. of its weight. Next came the iron

pipes, which lost from 20 to 30 per cent. of their weight. To determine how much loss might be caused by water itself, an experiment was made by placing a piece of iron pipe in pure water, when it was found that the loss entailed was 2.07 per cent. of its weight. Maylard suggests that solutions of bichloride of mercury should be thrown into the ash-pit rather than carried away by the usual waste-channels.

"The Berlin Water and Sewage Works" formed the subject of the opening address at the International Medical Congress at Berlin, by Virchow,⁹⁹ who showed that for these sanitary works an expenditure of 138,000,000 marks had been made. Nowhere in the world have such large tracts of land ever been used for the purpose of cleansing the sewage-waters of a city. The irrigation fields comprise an area of 7614 hectares, and in the year 1888 and 1889 the irrigation fields yielded a surplus of 238,000 marks over the working expenses.

Thomas Lowther¹⁵⁰, draws attention to the "man-hole chamber system of drainage," (house-drainage) in which the drains are laid in straight lines from man-hole to man-hole, with man-holes constructed over the intersecting trap and at such other points as may be found necessary, as at the angles and the intersection of the various branch drains. The man-holes should be constructed of impermeable material, with perfectly air-tight covers; the bottoms of chambers should be well formed in white enamel half-pipes, and well raised to prevent their being wetted by sewage. In this system Lowther claims that the inlets are not troublesome by acting as outlets, which appears to be due to the large body of cold air in the chambers, which thus prevents any back pressure. Lowther regards it as essential that as much air as possible should be passed through drains, especially in the drainage of hospitals, and calls attention to a paper by Newman denouncing ventilation altogether in connection with drainage. He states that Attfield has also denounced through ventilation, maintaining that the introduction of fresh air into drains assists decomposition, in which opinion he is seconded by others.

ALIMENTATION.

Meat.—Hans Beu,¹⁰ in discussing the preservation of meat, states that cold acts by preventing putrefactive changes in meat, 2° to 4° C. (35.6° to 39.2° F.), with good ventilation, preventing the

development of most organisms. Boiling, with subsequent exclusion of air, is good, but can be carried out only in large establishments. Drying rids the meat of water, but the taste is impaired. Salt acts by removing water, but removes also extractives, thus interfering with flavor. Smoke acts partly by drying, also by small quantities of antifermentative constituents. Beu concludes that most meats are salted not only to preserve the taste, but to withdraw a large proportion of the water; that smoking also withdraws water, hides the salty taste, and, being capable of penetrating dried flesh, is better able to exert its antiputrefactive action on salted than on fresh meat. Salted lean flesh, exposed to the action of smoke at from 22° to 25° C. (71.6° to 77° F.), for forty-eight hours, no longer contained liquefying organisms which had been present before, but non-liquefying organisms disappeared only on the ninth day of smoking.

Tuberculosis in cattle, and its bearing upon the meat-supply, is the subject of an article by E. W. Hope, of Liverpool.¹⁸⁷ Opinion is practically unanimous that, in advanced stages of tuberculosis in animals, the consumption of the flesh should be prohibited, not necessarily because specifically prejudicial in its effect, but on the general ground that the flesh has deteriorated.

The seizure of a carcass in Glasgow gave rise to an important trial, which was the subject of much comment in medical journals, and resulted in favor of the prosecution. Tubercl bacilli were found in the glands of the thorax, and there were tubercular nodules perceptible to the touch on the posterior of the lung and pleura of a bullock which, at the time it was slaughtered, had a perfectly healthy appearance. Attention was drawn by the inspector to the redness of the pleura, and examination with the above results followed. The medical officers of health of Leeds, Birmingham, Hull, Bradford, Holborn, and other experts, denied that the nodules were tubercular, and could find no traces of tuberculosis in the animals; but, even assuming that they were tubercular, the disease, they said, was so localized as in no way to affect the wholesomeness of the flesh, though, had there been any evidence of general infection, the carcass would have been rightly condemned. The other view, that the bullock was, at the time, suffering from acute tuberculosis, and that the carcass was unfit for human food, was supported by the medical officers of health of Glasgow and Edinburgh,—Coates, Whalley, and others. In his

remarks upon the evidence offered, the judge considered the disease in this case not merely local, since the bacilli were found in a gland; but he did not feel required to take the position that the carcass of every animal shown to have suffered from tuberculosis, however limited in degree, or, apparently, in locality, must be condemned.

In 1889, at Liverpool, there were 131 carcasses of graped (tuberculous) beef, representing over 31 tons in weight, taken and condemned, and prosecutions undertaken in respect to some of them. Comments² upon the now famous trial at Glasgow declare the verdict for the prosecution as fortunate, for so much attention was drawn to the reports at the time that it would have been little short of a national calamity had it gone out as the legal decision on a public health question that flesh from tuberculous animals, when taken in the alimentary canal of the human subject, is to be looked upon as innocuous.

Thomas Whiteside Hime,² of Bradford, thinks that the prosecution at Glasgow relied largely upon a resolution passed by the veterinary surgeons, assembled in congress at Paris, in 1888, condemning *in toto*, as unfit for food, meat from animals which, after slaughter, exhibited a trace, however minute, of tubercle, although a decree of the French government was passed immediately after expressly sanctioning the use of such meat. He states that the use of meat from animals suffering from localized tuberculosis is sanctioned by the laws of almost every European country, including France, Belgium, Holland, Prussia, Bavaria, Saxony, etc. Among other conclusions, he states that localized tuberculosis, it is well known, may never spread; it may be removed by the knife and the disease cured. Hence the existence of localized tuberculosis does not imply that parts of the body distant from the infected part are tubercular, or could infect if eaten cooked or raw.

An editorial² writer states that, even allowing that the danger to human beings through the consumption of tuberculous meat has been exaggerated, wherever tubercle bacillus is found in animal tissues or in milk there is danger of its producing tuberculosis if ingested; perhaps not in healthy individuals, but certainly in those whose tissues are in any way deteriorated by disease or injury. Because for so many years no connection has been made out between the two diseases, it most certainly does not follow that

none has existed. While the Local Government Board is investigating this subject, it is suggested ²_{May 10} that temporary arrangements should be made, first, to prevent the possibility of spread of the disease by channels that are even supposed to be tainted, and, secondly, to make some provision for the compensation of butchers for losses on condemned tuberculous animals; and reference is made to the Butchers' Mutual Association in Denmark, in which every animal has to be insured before it is killed, and by which compensation is made if the animal, on being killed, is found by the inspector to be diseased.

A. W. Clement, of Baltimore,¹⁰⁴ urges the stringent inspection of meat and milk as a safeguard against the spread of tuberculosis. He thinks tape-worm is also spread by eating partially cooked or raw beef and pork. Wm. H. Welch,¹⁰⁴ commenting upon this paper and upon use of meat from cattle affected with localized tuberculosis, stated that the positive assertions of veterinary and tuberculosis congresses as to the rejection of the flesh of tuberculous cattle and the views expressed in popular and alarmist articles on this point are not at present warranted by facts. Nevertheless, we have a right to consider the possibility of accidental contamination of the meat in the process of slaughtering tuberculous animals and also the natural repugnance against the consumption of the flesh of diseased animals. It is better to wait for further investigations before taking a decided position on this question. This, however, does not lessen the importance of sanitary inspection of slaughtered animals; for there are many diseases besides tuberculosis that can be conveyed by the use of diseased meat. In regard to the capability of meat from a tubercular cow carrying the infection, Leonard Freeman⁵³, states that, no matter how extensive the tuberculosis may be, it is rare to find tubercular nodules in the muscles. This also agrees with the last report of the Bureau Consultatif d'Hygiène of France.

A royal commission has been appointed¹¹¹² by Queen Victoria to inquire and report what is the effect, if any, of food derived from tuberculous animals on human health; and, if prejudicial, what are the circumstances and conditions with regard to tuberculosis in the animal which produce that effect upon man? In Berlin² a large number of inspectors, after rapidly examining each fresh carcass for any gross lesion, remove a portion of the abdomi-

nal and laryngeal muscles and small portions of the diaphragm and subpleural fascia. These are carried into a laboratory, where some twenty-five or thirty officials make microscopic examinations with a low power, which is quite sufficient for detecting trichinosis or the grosser lesions of tuberculosis.

Fish.—T. H. Seelmann¹⁰⁷ believes that there is a specific fish-poison, which exists in certain living fishes and in certain organs of the same, although the diversity of toxic effects points to the conclusion that there is more than one class of fish-poison. Among the few fresh-water fishes that are poisonous may be mentioned the barbet. The roe of this fish caused, in various parts of Germany and France, in 1851, the so-called "Barbet Cholera." The exanthematic form is caused principally by different mackerels, the bonitos of the tropical seas, and the tunny of the Mediterranean. In Japan and China the poisonous property of fishes belonging to the genera Diodon, Triodon, and Tetraödon is so well known that, not only are they used for purposes of murder and suicide, but their sale is prohibited by law. Fish-poison is not limited to fresh fishes, but is found in preserved fish, particularly in Russian countries. In this connection John Roach²² states that the Emperor of Russia has offered a reward of 5000 roubles to the scientist furnishing the best essay on the nature, prevention, detection, antidotes, treatment, etc., of fish-poisons.

The fatal poisoning by mussels of a mother and three children near Dublin, June 30th, prompts the statement², that the venomous properties of this shell-fish are dependent on incidental circumstances. There is no class of mussel which is always poisonous. The poison is due, in Dutertre's opinion, to a true disease attacking the liver of the mollusk. An alkaloid mytilotoxine, which was extracted by this observer from the diseased organ, was found to act in the same way as curare. The action of the French government in restricting the sale of mussels to certain months in the year⁶, is characterized as being of no advantage, though, while this means of protection is regarded as futile, no other precautions are suggested.

Sir Charles A. Cameron² records the apparent poisoning by oysters of nine persons in Dublin, and points out that oysters growing in estuaries and other places to which sewage has access

must often contain sewage in their juice, and he had found this to be the case with oysters collected near Dublin.

Milk.—It is stated⁶ that in New South Wales the dairy-man is required to give notification of a number of diseases in animals as well as those in human beings who are concerned in the milk business; and opportunities exist, therefore, for controlling the sale of milk from animals suffering from maladies which render the milk dangerous. It is now generally accepted that milk from animals suffering from eruptive disease of the udder should not be used. Harold C. Ernst,¹⁵ as the result of preliminary experiments, gives the following conclusions: 1. That the milk from cows affected with tuberculosis in any part of the body may contain the virus of the disease. 2. That the virus is present whether there is disease of the udder or not. 3. That there is no ground for the assertion that there must be a lesion of the udder before the milk can contain the infection of tuberculosis. 4. That, on the contrary, the bacilli of tuberculosis are present and active in a very large proportion of cases in the milk of cows affected with tuberculosis, but with no discoverable lesion of the udder.

The effect of dilution on the virulence of the milk of tuberculous cows is the subject of experiments by Gebhard,²⁵ under the direction of Bollinger. Milk taken directly from the udder of tuberculous cows completely loses its virulence when diluted from 40 to 100 times. The danger of such milk is therefore diminished by mixing it with the milk of all the cows in the same stock which are not tuberculous. The practice of using warm milk from a single cow ought to be discarded. That there exists individual predisposition was shown by the fact that a pure culture diluted 200,000 times gave a negative result in some guinea-pigs, whereas in others a dilution of 1 in 400,000 produced tuberculosis.

Theodore Bange⁵³ states that the office of milk-inspector in Cincinnati was created twenty years ago, and has accomplished in that course of time much good, but is not up to the requirements committed to it. There are 300 dairies delivering milk and about 1200 grocers and bakers selling milk, the daily sales amounting to 20,250 gallons of whole milk. There being the need of an established standard of milk, such standard was established by visiting several dairies, and having a number of cows, not less than 20 in each dairy, milked in the inspector's presence. The dairies were

in both city and country. These samples were then analyzed, and all of them proved to be fully up to the standard which was later adopted,—some of them above it. The following is the standard adopted at that time: Milk must not contain more than 87 per cent. of watery fluid, not less than 13 per cent. of total milk solids, and not less than 9.3 per cent. of solids exclusive of fat. This standard was afterward changed to $12\frac{1}{2}$ per cent. of total milk solids.

D. C. Barber, of Los Angeles,¹⁴⁷ states that after allowing a difference in the character of the milk, due to different conditions of race, age, food, etc., of the animal furnishing it, the specific gravity should not fall below 1029, and that in 100 parts there should be at least 12 per cent. of solids, no more than 88 per cent. of water, or $2\frac{1}{2}$ ounces (77 grammes) of food to the pint (500 grammes) of fluid.

The question as to how long tubercle bacilli retain their virulence in milk is discussed by Leonard Freeman,⁵³ who says that Herm has obtained successful inoculations with sour milk ten days old. In rancid butter, which had been kept four weeks, living bacilli still existed. Hence, milk a week old and butter a month old are scarcely any safer than if they were absolutely fresh.

Liquors.—The following artificial processes, more or less innocent, are now employed¹⁰⁷ in the old wine-growing countries, viz.: “Petiotization,” or adding sugar-water to the residue after pressing and subjecting the mass to fermentation; “Chaptalization,” or improving acid by addition of cane-sugar and pulverized marble, the latter eliminating the acid in the shape of insoluble tartrate of lime; “Gallization,” attenuating acid with water until its degree of acid is reduced to the usual degree of good crops, and then adding an adequate quantity of grape-sugar; “Scheelization,” or the addition of glycerin, making the wine appear more substantial; “Pasteurization,” or heating to 60° C. (140° F.), to render it more durable. In addition to the above manipulations, a long series of other operations have been added in Europe, which are both injurious and fraudulent, and, to combat them, the most important governments of Europe have taken stringent measures. Among these adulterations may be mentioned the excessive use of gypsum, the use of artificial wine colors, the use of sulphuric acid and nitric acid, to increase the intensity of coloration.

Bread.—A report of the special sanitary commission⁶ on bakeries and bread-making contains a full account of the business of bread-making, as carried out in several European countries, particularly in Belgium, where, through the individual initiative of the working-class, remarkable results have been obtained by co-operating societies. The most noted factory of this kind is at Ghent, called the “Vooruit” (Flemish for “Forward”). The business of this co-operative society amounts now to an annual turn-over of more than 2,000,000 francs. With the ovens actually erected, the Vooruit Society can turn out 100 loaves every seventeen minutes, and it is actually producing 43,000 loaves per week, and supplies some 18,000 people with their daily bread. The evolution of the bread-making industry, by which is meant that the small master-bakers are being driven off the field by large companies and the “cutting” trade, is also going on in France, Scotland, and England. At Glasgow 137 pounds of bread are made with 100 pounds of flour, and at Ghent 135 pounds. The Ghent co-operators pay their men 25 per cent. more than the current rate of wages in the trade..

Canned Foods.—Four cases of poisoning caused by tinned cherries are mentioned by Arthur P. Luff.² The tin (a large one) was about half full of cherries and juice. The juice was strongly acid, and analysis showed that the acidity was due to malic acid, with a small quantity of acid tartrate of potash. The juice contained tin in solution, a quantitative estimation of which showed that every fluidounce (28 cubic centimetres) contained the equivalent of 1.9 grains (0.12 grammes) of the higher oxide of tin, which would be equal to 3.2 grains (0.20 grammes) of the malate of tin in each fluidounce of the juice, or 60.4 grains (4 grammes) in a pint of the juice. It appears that the tin was not dissolved by the action of the malic acid of the juice on the tinned surface, but that the solder (consisting of tin and lead) acted as a galvanic couple in the presence of the malic acid, the tin taking the rôle of the negative element, and passing into solution. As far as can be estimated, the alarming symptoms in the patients must have been produced by doses of the malate of tin, varying from 4 to 10 grains (0.26 to 0.65 grammes). Johnson, of Brooklyn,²³⁸ for the guidance of consumers of canned goods, advises that every cap should be examined, and, if two holes are

found in it, the can should at once be sent to the health-board. Only one hole in the cap is needed to let out the air before final sealing. Two holes show that the can had begun to swell on account of the decomposition, and had been punctured and resealed. If decomposition is commencing, by pressing up the bottom of the can, the tin will rattle, the same as the bottom of the oiler of a sewing-machine does. If the goods are sound it will be solid, and there will be no rattle of the tin.

The Hungarian Secretary of the Interior,¹⁰⁷ has published a stringent decree with regard to the use of lead and zinc in vessels for food. The use of lead or alloys containing more than 10 per cent. of lead in their weight, in the manufacture of vessels for eating, drinking, and cooking purposes, is prohibited, as is also the use of an alloy containing more than 1 per cent. of lead, for tinning, or of an alloy containing more than 10 per cent. of lead for soldering such vessels.

SCHOOL HYGIENE.

George H. Rohé⁶¹ enumerates the following evil effects of improper school hygiene: (1) near-sightedness; (2) pulmonary consumption; (3) spinal deformities; (4) nervous and digestive disorders; (5) contagious diseases. The writer gives the plan which the Board of School Commissioners of Baltimore have sought to carry into effect, viz.: (1) to examine all plans for the construction of new school-houses, and give necessary suggestions; (2) to advise with the commissioners with reference to necessary alterations in school-buildings; (3) to examine all text-books before adoption, with regard to their type, paper, etc.; (4) to examine all pupils admitted to the schools as to vaccination; (5) to take such measures in connection with the health commissioners of the city as may be necessary to prevent the spread of contagious diseases; (6) to examine annually the eye-sight of children attending the schools; (7) to report annually upon the sanitary condition of the schools and pupils; (8) to give instruction, by lecture or otherwise, to the teachers upon the principles of school hygiene; and, finally, to appoint a sanitary superintendent for the schools.

VACCINATION.

R. Drysdale²² refers to observations made by himself at Berlin, where there has been remarkable success in the experiments

in vaccination carried on since the year 1874. In 1872 the great epidemic of small-pox broke out, and in 1872 and 1873 the mortality rose to 243 and 262, respectively, per 100,000 inhabitants, and a law was then passed enforcing vaccination in the 1st year of life, and re-vaccination in the 12th year, with the result that in 1875, the first year when the law was enforced, the mortality from small-pox fell to 3.6 per 100,000; in 1876, to 3.1; in 1877, to 0.3; in 1878, to 0.7; in 1879 it was 1.2; in 1880, 2.6; in 1881, 3.6; in 1882, 3.6. In 1885 it was reported that not a single case of death from small-pox had occurred in the German army since 1874, and as a result of vaccination and re-vaccination in Berlin and other German cities, in the nine years from 1875 to 1883, the average annual small-pox mortality was 1.7 per 100,000 inhabitants of these cities, as against 25.83 in London and 89.29 in Vienna. The use of animal vaccine is gradually superseding that of humanized lymph in Berlin and in many other parts of Prussia. The law there enjoins that, whenever it is procurable, calf-lymph is to be used.

T. P. Corbally,⁷⁹ referring to the epidemic of small-pox in Sheffield in 1887 and 1888, states that the vaccinated children had, as compared with the unvaccinated children living in the town, a twenty-fold immunity from attack by small-pox, and a 480-fold security against death by small-pox. The twice-vaccinated persons over 10 years of age had, as compared with the unvaccinated, 640-fold greater security against death. In Sweden the number of deaths in 100,000 persons before introduction of vaccination was 165.82; with voluntary vaccination, 55.60; and with obligatory vaccination and voluntary re-vaccination, 18.20. In Germany, previous to 1875, the average deaths in 100,000, during a period of ten years, was 33.84; since 1875, when vaccination was made obligatory, the average has been 2.23. In England, the average for the ten years which preceded obligatory vaccination was 16.98; since, it has fallen to 7.61. In Paris, where vaccination is voluntary, the average, from 1875 to 1885, was 28.95 in 100,000; in Vienna, with the voluntary system, 84.37; in Prague, voluntary, 165.43; in London, primary vaccination only obligatory, 25.50; in Berlin, vaccination and re-vaccination obligatory, 1.68; in Dresden, the same conditions, 1.65. Comment is unnecessary. In Germany the crust only is used, dry or in combination with

glycerin, and can be used only when the autopsy of the animal proves that it was healthy. Of 822 animals intended for the culture of the virus in 1887, 24 were rejected for diseases which the autopsies proved to exist. In the inoculation of animals scarification in patches should be avoided, because inflammation and infiltration and suppuration of the parts destined for the culture may follow. This method yields a greater quantity of matter, but it has been demonstrated that this lymph contains a certain number of bacteria different from the true vaccine, and consisting of the coccii of the suppurative process, which injure by their development the result of the operation. Hay says that in Holland about 150 punctures are made in each animal, and in this way isolated pustules are obtained, which develop without inflammation.

Some comment has been excited by the publication of two volumes by E. M. Crookshank on the history and pathology of vaccination, in which attempt is made to prove its inutility. Vigorous protests and severe criticisms of the work have been made by various writers, claiming that Crookshank, who has published the best book that the anti-vaccinators can produce, has not touched the great problem with regard to vaccination which still remains to be solved; that he has not done one original experiment and has misrepresented the work of others.

In reply to some of his critics, Crookshank⁶² concludes as follows: "I still maintain that there is no scientific support for what is generally understood as 'vaccination,' and that the practice is destined in more enlightened times to fall into desuetude, being replaced by the more rational and comprehensive procedure of the compulsory notification of small-pox, and the isolation of all cases of this disease, or, in other words, the stamping-out system."

O'Hara²⁰⁸ is reported as having observed in the donkey an efficient substitute for the calf as a vaccine-lymph agent. He claims that, while the virus obtained from the donkey is readily re-transmissible to the calf, is not altered by such transmission, and produces results exactly similar to those of ordinary vaccination, it is cheaper, donkeys being obtainable in almost every village at nominal cost; that it is useful for renovating calf-lymph employed through several generations, and may be used when calf-lymph is not procurable, during the hot months, when fodder is scarce and cattle are driven to distant grazing-grounds. Chonneau-Dubison⁸² has

experimented with she-goats, and found that vaccine obtained from them is inoculable in the infant. Tuberculosis being exceedingly rare in goats, the she-goat is, therefore, the most appropriate source for vaccine virus. Much attention has been attracted by the Reports of the College Commission on Vaccination, the subjects to which the Commission is to make report and inquiry being: 1. The effects of vaccination in reducing the prevalence of, and mortality from, small-pox. 2. The means, other than vaccination, for diminishing the prevalence of small-pox. 3. The objections made to vaccination on the grounds of injurious effects. 4. The means to be adopted for preventing or lessening the ill effects, if any, resulting from vaccination. 5. Whether any alterations should be made in the arrangements for securing performance of vaccination, and, in particular, in the provisions of the vaccination acts with respect to precautions for non-compliance with the law.

Henry B. Baker²³⁴ expresses the opinion that compulsory re-vaccination of adults cannot be reached on the same principle as primary vaccination. It is a question relating not to a child without discretion, but to the person of an intelligent and responsible individual. Baker thinks that compulsory vaccination of an intelligent adult person is such an interference with the liberty of the individual relative to his own person as is not for the public good.

DISPOSAL OF THE DEAD.

Out of some 25 physicians of Philadelphia,¹⁹ interviewed upon the subject of cremation, only 3 were found definitely opposed to cremation. Out of 41 physicians interviewed in Baltimore, 6 were opposed to it.

E. von Esmarch¹⁵⁷ gives his opinion in relation to the dangers of contagion through the drainage from cemeteries. His experiments show that the water or earth surrounding the body does not become contaminated with germs; that in the case of anthrax the bacilli die out very quickly from the dead body. He does not think the disappearance of pathogenic organisms from a dead body is due to the destructive processes of putrefaction, as the same organisms disappear from tissues preserved by antiseptic fluids. He concludes that the proximity of cemeteries and the drainage-water from them have no influence in the spread of epidemic or contagious diseases.

C. A. Harvey⁶¹, states that cemeteries of the city of Brooklyn occupy nearly 2000 acres of land, and that opinions have been expressed that the prevailing wind blowing over these corruption-festered plague-spots, carries the germs of typhoid fever and diphtheria to Flatbush.

He advocates a process of desiccation of human bodies, and states that in a laboratory connected with one of the medical colleges in New York an apparatus has been prepared for carrying on experiments in a scientific manner. The result is procured by the use of dry air. Air-tight boxes of galvanized iron are used with glass tops. At one end of the box is an induction pipe, and at the opposite end a conduction pipe. The atmosphere is rendered anhydrous by the use of calcium chloride. After the humidity is extracted the dry air at once enters the box and comes in contact with the body, then passes on to a flue and through a large gas flame which is kept burning therein. The body of a man who died one year ago is now lying in an apparatus at the New York University Medical College in a complete state of desiccation. This disposition of the dead embraces the idea of a great number of sepulchres constructed to form one grand mausoleum. A building 100 feet square will contain 10,000 sepulchres. One 300 feet long by 100 wide, will contain 30,000, or a number equaling the usual allowance for a cemetery of some 90 acres.

It is stated^{6, 17}, that cremation makes rapid progress in the Latin countries, particularly in Italy, where it is simply a return to the usage of classic times. In Germany it is slower in finding public favor. The number⁶¹ of cremations increase every year. In London, from 1884 to 1887, there was an average of only 8 per year; in 1888 there were 26; in 1889, 46. It is said that 3000 bodies were cremated in 1889. In Rome there were 119 cremations in 1886, 155 in 1887, and 202 in 1888.

EPIDEMIOLOGY.

DENGUE.

According to Edward F. Willoughby, of London,⁵ dengue appeared, in June, 1889, almost simultaneously, at Beyrouth, Jaffa, and other places, spreading with a rapidity equal to that previously seen only in Hindustan. By the end of August 20,000 persons

at Beyrouth, in a summer population of 100,000, had been attacked; in Smyrna 150,000 out of 200,000; and at Jaffa scarcely any one escaped. Constantinople was reached a few days after its appearance at Smyrna, and it extended over the whole of Asia Minor, even at elevations of 4000 to 5000 feet above the sea; and late in the summer of 1889 it reached Athens, which was its extreme western limit. The United States Consul at Cadiz, Spain, reported, December 28, 1889, that there were 20,000 cases of dengue in Madrid¹¹¹⁹; that it appeared in different cities of France in a mild form, and that in Rome there were thousands of cases, but all mild. In January the epidemic assumed a very malignant character at Barcelona, Madrid, and Seville, a very large daily death-rate being then reported at Madrid.

An article¹⁵³ commenting upon the observations of de Brun, of the Beyrouth Medical Faculty, upon the nature of dengue fever, calls attention to the fact that this disease, so long domiciled on the Oriental littoral of the Mediterranean in the epidemic of 1889, had finally passed one of the last outposts of the European frontier, and that, although a native of the tropics, it is readily acclimated in the temperate regions. De Brun affirms the contagiousness of the disease, and describes it as first localized, then as spreading from house to house and quarter to quarter of a city, advancing steadily and without retrogression; that every patient attacked is a source of contagion to all around him, and forming, with those to whom he has imparted the contagion, a centre of production and propagation of the disease. The personal observations of de Brun prove that when dengue attacks the members of a household the domestic animals present an ephemeral indisposition, characterized by weakness, want of appetite, and fever.

INFLUENZA.

As far as can be ascertained,¹¹²² the first cases of the pandemic of influenza of 1889 and 1890 were observed early in October, in Vjatka, one of the most easterly provinces of Russia. Other cases were reported a little later from the Caucasus; and about the middle of October the disease was declared to be prevalent at Lowsk, in Western Siberia. Early in November it appeared in St. Petersburg, where, in six weeks, it reached an almost unprecedented diffusion; thence it spread over Western Russia and Eastern Germany,

and about the 1st of November it reached Berlin. Early in December Paris was attacked, and the cities of Southern and Central Germany, Austria, and France were reached in turn. About the middle of December cases were reported in London and other English cities, and about the same time cases began to be observed in New York. The outbreak of the epidemic in Boston, Philadelphia, Washington, and Canada soon followed. In the United States the disease progressed steadily westward, while in Europe it invaded the extreme north and south and finally crossed the Mediterranean into Africa.

The etiology of the disease remains undetermined, the one fact with regard to it which is supported by general observation being its genesis in the north and its dissemination throughout Europe in the direction of the east winds. That it is primarily microbial is open to doubt, in view of its rapid propagation. Mortality is not proportioned to its expansion, but depends on the special condition of the individual and on time and place. The gravity of the late epidemic may be shown by the following numerical statement. The population of Europe is about 350,000,000. No country was exempt, and the number of persons attacked is estimated to have been 25 per cent., or a total of from 80,000,000 to 90,000,000. This estimate is probably short of the actual number. Reports from the large cities show that in some cases one-half, in others two-thirds, of the population were attacked. Mortality during the epidemic was greatly increased, and, admitting a proportion of 1 per cent. due to influenza, we have a total of nearly 1,000,000 deaths. Lowering the rate by one-half, or 5 deaths to 1000, leaves a total of 500,000 deaths. It is thus apparent that the disease is responsible for an enormous mortality,—a mortality out of proportion to its severity. There is always a large contingent of persons sick of serious general affections. When the influenza was added to their other ailments they died in large numbers, victims of the combination they were unable to resist.

CHOLERA.

A consideration of the cholera epidemic in Turkey in Asia, during the year 1890, is necessarily preceded by a statement of a few facts with regard to the cholera of 1889, for, practically, the epidemics of the two years, at least so far as Mesopotamia is concerned, were one and the same.

Mesopotamia.—The first deaths in 1889 were reported by the Ottoman Sanitary Department², on July 25th. The disease appeared at Naseriyeh, a town on the left bank of the Euphrates, on August 2, 1889. On August 3d it was reported from Shatra, a low-lying district, subject to inundations and traversed by a canal which connects the rivers Euphrates and Tigris. It appeared in rapid succession in other towns in Mesopotamia, notably in Bassorah and in Bagdad, in which latter city the first case occurred August 12th. The total number of deaths in Bagdad up to November 28, 1889, reached probably 1600, the population of the city being 100,000. Moving toward the Persian frontier, cholera appeared at Khanakin, about 8 miles from the Persian line and about 95 miles from Bagdad. Through this town, Khanakin, many hundreds of Shiah pilgrims from Persia and India pass annually *en route* to and from the shrines at Karbala and Najaf. There are four Shiah shrines in Mesopotamia, one of the most sacred, Karbala, being a place of pilgrimage for large numbers of Indian, Persian, and other Shiahhs. Thousands of bodies from every country where the Shiah faith exists are taken to Karbala for interment, so that the place is one vast burial-ground. The epidemic raged at these shrines in August, 1889.

Bowman², advances certain reasons for believing that the disease was not introduced from India, and points out that the character of the district known as Shatra, just above described, is very favorable to the origin of the disease *de novo*, the same conditions existing there as in the Gangetic delta, with one exception, that the population is sparser. On the contrary, as tending to show the probable Indian origin of the epidemic, an article⁸³⁰ states that a Mohammedan sect known as the "Chitti" have the custom of burying bodies in the holy city of Islam (Mecca), situated in Mesopotamia. Some bodies were sent from Bombay for sepulture in this city. They were disembarked at Bassorah and sent by land along the route to the holy city, through the district of Montifik, where the cholera first manifested itself. It is supposed, therefore, that cholera was imported from Bombay by the clothes in which the dead were wrapped, or by the relatives who accompanied the bodies. Concerning this same epidemic of 1889 in Mesopotamia, Gabruzzi, under date of December 5, 1889,¹⁵³ reports that, though it had gradually invaded the whole plateau watered by the Tigris

and Euphrates, as far as the city of Mossoul, it seems to have been suddenly arrested at that point.

At the beginning of the year 1890, then, there appears to have been no especial prevalence of cholera in the East, and the United States Consul at Beirut, Syria,¹⁴⁶ stated on January 9 that no cholera cases had been reported in Mesopotamia for the previous twelve days. On January 27th, however, unofficial information from Constantinople was received to the effect that cholera was extending into Mesopotamia. The re-appearance of cholera in Mesopotamia in April⁸⁷, was noted in the city of Mossoul. In July the statement was made¹⁵³ that cholera appeared to be dormant, and had not spread either north or east of Mossoul; that later in the summer and in the autumn it would re-appear in the various cities on the Euphrates.

From June to August, 1890, the cholera epidemic attacked the provinces of Mossoul and Diarbekir, in the north of Mesopotamia and Bittis, in Armenia.¹⁴⁶ In October the disease seems to have disappeared from the cities in Mesopotamia, which were strongly infected,¹⁵³ namely, Van, Diarbekir, and Tiflis. From this time on no special report of the cholera in Mesopotamia has been received. In the meantime, however, the epidemic had appeared, and spread to other portions of Turkey in Asia.

The English steamer "Duccan" arrived at Camaran⁸⁷, from Bombay, July 2d, with 1222 pilgrims on board. Camaran is an island in the southern end of the Red Sea, on which is located the Lazaretto. During the voyage 34 passengers had died, 7 of the deaths being from cholera. Fourteen more died after disembarkation. The cholera did not break out among the pilgrims at Mecca until the latter part of July, 1890,², and the first cases occurred at Jeddo on August 1st. Whether the disease was imported direct from Bombay, as on previous occasions, or, as in 1846, was brought overland by the caravans from Bagdad, is not known; but the latter hypothesis seems probable, from the fact of its having broken out at Mecca some ten days earlier than at Jeddo, and because of its prevalence for many months along the whole Euphrates Valley. Mecca, with its port of Jeddo, being the great focus for the development of the epidemics in this quarter of the globe, as Hurdwar is for India, Alexandria is the cholera gate for Europe, whence the epidemic diverges in every direction, secondary foci being presented

by Marseilles, Constantinople, and Odessa. In round numbers, 43,000 pilgrims arrived by sea at Tambo and Jeddo^{2 Sept. 20}; all were provided with return tickets, but not more than 28,000 would probably avail themselves of them. The balance represented the victims. The chief of one caravan asserted that on starting it was composed of 2500 persons, and on arrival there were only 900 left.

The Hejaz, that province of Turkey in Asia bordering upon the Red Sea, its eastern boundary being Arabia, and comprising the sacred cities of Mecca and Medina, with sea-ports of Jeddo and Yembo, is the objective point of Mohammedan pilgrimages. The epidemic of cholera had almost disappeared with the departure of the pilgrims from the Hejaz. The ravages of the cholera in the Hejaz number 4171 deaths, of which 2785 should be set down to Mecca, 1337 to Jeddo, and 49 to Yembo. Under date of October 31, 1890, the U. S. Minister at Constantinople transmitted a report received by himself to the effect that very sad news is noticed from Assyr in Yemen. Yemen is a province of Southern Arabia, bordering upon both the Red Sea and the Gulf of Aden, and adjoining the straits of Bab-el-Mandeb, the southern entrance to the Red Sea. The report states that the kind of sickness is unknown, but that a caravan of 2500 persons started from Mecca to Assyr and arrived at that place with 1000 men. From the same minister, with a dispatch dated December 26, 1890, was transmitted a report stating that the sickness which is raging in the Yemen is officially declared to be cholera. The epidemic of cholera was intense¹⁵³ in Abyssinia, in the localities occupied by the Italian troops. At Massowah, which is on the west coast of the Red Sea, toward its southern extremity, about 60 deaths occurred daily, and the Italian government, through fear of conveying the disease, deferred the return of the troops from this colony. Cholera, in the meantime, made its appearance in Venice. The U. S. Consul at Cape Town, under date of August 26, 1890, telegraphed that cholera had appeared at Natal, Africa.

The Russian government has published a report, based on the statements of the Russian Consul at Bagdad.^{2 Mar. 16} With regard to Persia, cholera was raging especially in Kermanshakh, Hamadan, Melaïr, Asadabad, Khoremadab, in each of which towns there were dying, on an average, about 20 persons a day, while in the Melaïr district every village was losing three or four inhabitants

daily. The epidemic continued to spread in Persia, though to a somewhat lesser extent than in October and November of 1889. The infected localities were situated a few hundred versts from the Russian frontier, and active measures had been adopted by the Russian government to prevent the introduction of the disease.

According to a report of E. W. Alexander, American missionary physician at Hamadan, transmitted by the U. S. Minister at Teheran, cholera entered Persia in September, 1889, and was nearly extinct by January, 1890. It was distributed over 6000 miles of territory, inhabited by 400,000 people. The mortality is not known, but it was supposed to be less than 2000 for the whole district.

Information was received at Constantinople,⁸⁷ to the effect that there had been a complete cessation of cholera in Persia in February. Advices from Constantinople,¹⁴⁶ bearing date September 25, 1890, were to the effect that cholera has made its appearance at Meskéné and Aleppo,—Meskéné, a small village on the Euphrates, about twenty hours' distance from Aleppo, Syria. Cholera was imported into Aleppo from Mesopotamia by way of Orpha and Meskéné. The U. S. Consul at Beirut transmitted to the Marine-Hospital Bureau¹⁴⁶ a statistical table giving the number of cases as 39 and number of deaths 25, in Aleppo, during the period embraced between September 11th and 25th, inclusive. The villages surrounding Aleppo and Orpha were soon infected, as well as Alexandretta, the sea-port of Aleppo, where it was carried by soldiers.

Antioche and other villages in the vilayet of Aleppo were infected by October. For the two weeks ending November 8, 1890, were reported 492 deaths in Aleppo and Hamah, Syria.

The United States Minister at Constantinople stated¹⁴⁶, that from the beginning of the epidemic to the end of November 1296 deaths occurred in the vilayet of Aleppo. Cholera appeared at Adana, a short distance inland from Mersina, the principal sea-port of the province of Adana, in November. Up to the 26th of December 2113 deaths had occurred in all the province of Aleppo. At Beirut it was reported, on December 15th, that cholera had made its appearance in Tripoli, a sea-port on the Syrian coast, about 40 English miles north of Beirut, 42 deaths having occurred between the 8th and the 14th.

The first place affected in Spain in 1890 was the village of Puebla de Rugat.⁸⁸. "The commencement of the disease is said to

have corresponded to the time of the excavation of a considerable amount of drain-sodden earth in the village, and, remembering the history of the province of Valencia during the epidemic of 1884-86, it is quite possible that we may here be seeing a recrudescence of the disease. Recalling that there is an interval of but four years between the former and the present outbreak, it is not difficult to conceive that the link between the two may have remained on Spanish territory." In further consideration of the probable origin of this epidemic, it should be stated that rumor of an unofficial character has assigned the cause of the outbreak to carelessness in the handling of the cultures of the cholera-germs in a bacteriological laboratory connected with one of the Spanish hospitals.

There were, between June 15 and July 5, 1890, 144 cases and 36 deaths from cholera at Gandia, a small town on the sea-coast, 40 miles south of Valencia, which in the last epidemic was a focus of infection. An editorial says,²: "If the epidemic in Valencia be the consequence not of a recent importation, but of a recrudescence or 'unearthing' of the germs of 1885 and 1886, we shall probably see like epidemics in other districts, for the Spanish towns, with very few exceptions, are like tinder-boxes awaiting the spark to kindle the conflagration." Cholera also appeared at Denia, in the province of Alicante, on the Mediterranean, adjoining the province of Valencia, in July.

According to the United States Consul at Barcelona, after the 8th of November no cases of cholera appeared either in the city or province of Valencia. "Corrected returns show that in the province of Valencia there were 2943 cases and 1493 deaths, while in the city there were 1128 cases and 651 deaths, making a total of 4071 cases and 2144 deaths for the epidemic of 1890."

One death from cholera occurred at Regoa, in Portugal.⁸²⁰

Guelpa,²⁹⁰ reported that he had been called to attend a case which he identified with cholera. Roussel reported 3 cases of cholera at Toulon among the soldiers lately returned from Tonquin. These were the only cases reported in France.

At Singapore, India, for the month of May, 1890, 20 deaths from cholera were reported. A total of 859 deaths for the year 1890 was reported from Calcutta. In Sumatra, cholera was declared to be prevalent in December, 1889, to such an extent that quarantine was established against Sumatra by the Governor of the

colony of Queensland, Australia. According to the United States Consul, Asiatic cholera made its appearance at Nagasaki, Japan, on June 27, 1890. The last reports received state that, during the outbreak of the epidemic in Nagasaki-Ken, from June 27 until November 4, 1890, 3723 cases were reported and 2507 deaths, and that on November 8th Nagasaki-Ken was officially declared to be free of the disease. The dead were in most cases cremated. In the town of Yokohama, from October 7 to November 3, 1890, 33 new cases of cholera and 52 deaths occurred, and in the adjacent districts 64 new cases and 112 deaths.

Under date of September 20, 1890, the United States Minister reported the presence of cholera at Fusan, in Corea. The number of Coreans who died is unknown; but in a Japanese population of about 3000, 109 up to August 26th had been attacked and 71 had died. At the close of 1890, then, cholera had practically disappeared from Mesopotamia and the Hejaz and also from Spain, had almost disappeared from Japan, but still lingered in Syria and Arabia.

The influenza and the cholera appear to have been the only two epidemics that prevailed to any considerable extent during the year. The prevalence of yellow fever and small-pox in different localities may be observed by reference to the tables at the end of this article.

TUBERCULOSIS.

E. F. Brush⁵¹, considers the coincident geographical distribution of tuberculosis and dairy cattle. If it were possible to show by reputable authority that the geographical distribution of human tuberculosis was coincident with that of bovines afflicted with this disease, the inference would be that they stood to each other in the relation of cause and effect. He showed that, in lands like Egypt, the indigenous inhabitants retained immunity while associating, for long periods, with consumptive immigrants, while, on the other hand, in regions like Australia and the Sandwich Islands, the inhabitants have become infected after the introduction of dairy cattle. Referring to China, he spoke of the poor Chinese as a people who did not use milk, while the Tartars in that country were milk and meat consumers; and, therefore, the observations of medical men are very confused, and they confess that they cannot understand why the disease prevails among the dominant Tartar class, and not among the poor Chinese, who, according to

all preconceived notions, ought to be tubercular. In South America, where cattle are exceedingly numerous, but the use of milk almost unknown, or used only after being boiled, the natives still enjoy a large immunity. Taking a geographical square of 10 degrees, embracing Spain and Morocco, Brush contrasted the two countries, in which climate and other conditions must be nearly equal; but Morocco, where there are no European dairy cows, is exempt from tuberculosis, while in Spain and Portugal, where dairying is carried on in the European style, tuberculosis prevails.

COMPARATIVE MORTALITY TABLE OF CERTAIN CITIES OF THE UNITED STATES
FOR THE YEAR ENDED DECEMBER 20, 1890.
(As reported to the U. S. Marine-Hospital Bureau.)

CITIES.	POPULATION, CENSUS OF 1890.	TOT. DEATHS FROM ALL CAUSES.	ANN. RATE PER 1000 OF POPULATION.
New York, N. Y.	1,513,504	40,288	26.6
Chicago, Ill.	1,099,133	21,616	19.6
Philadelphia, Pa.	1,046,964	21,706	20.7
Brooklyn, N. Y.	806,343	19,797	24.3
Baltimore, Md.	434,439	10,123	23.3
St. Louis, Mo.	460,357	8,433	18.3
Boston, Mass.	443,477	10,291	22.9
San Francisco, Cal.	293,997	6,808	22.8
Cincinnati, O.	296,908	6,617	22.3
New Orleans, La.	241,995	7,088	29.2
Detroit, Mich.	205,669	8,884	18.8
Washington, D. C.	230,392	5,468	23.7
Cleveland, O.	231,546	5,044	19.2
Pittsburgh, Pa.	238,617	5,094	21.8
Milwaukee, Wis.	204,150	3,668	17.9
Louisville, Ky.	161,005	3,529	21.9
Minneapolis, Minn.	164,738	2,431	14.7
Newark, N. J.	181,518	4,567	25.1
Kansas City, Mo.	132,416	2,186	16.5
Denver, Col.	106,670	2,878	26.9
Rochester, N. Y.	138,327	2,193	15.8
Providence, R. I.	132,043	2,849	19.2
Indianapolis, Ind.	107,445	1,733	16.2
Toledo, O.	82,652	1,357	16.4
Richmond, Va.	80,838	2,288	28.3
Fall River, Mass.	74,398	1,650	22.1
Nashville, Tenn.	76,809	1,442	18.8
Charleston, S. C.	54,592	1,771	32.4
Portland, Me.	36,608	729	19.9
Galveston, Tex.	29,118	596	20.4
Council Bluffs, Iowa	21,388	313	14.6
Binghamton, N. Y.	35,093	563	16.0
Yonkers, N. Y.	31,945	539	16.8
Altoona, Pa.	30,269	464	15.3
Auburn, N. Y.	25,887	571	22.1
Newton, Mass.	24,357	362	14.8
Newport, R. I.	19,449	832	17.1
Rock Island, Ill.	13,596	197	14.4
San Diego, Cal.	16,153	172	10.6
Pensacola, Fla.	11,751	237	20.2

CHOLERA IN 1890.

(From the Records of the U. S. Marine-Hospital Bureau.)

COUNTRIES AND CITIES WHERE PRESENT.	DEATHS.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
<i>Africa:</i> (a) Natal.												
<i>Corea:</i> (b) Fusan								71				
<i>France.</i>												
<i>India:</i> Calcutta	120	236	115	95	41	42	45	22	10	10	69	54
Singapore					28							
<i>Japan:</i> (c) Hiogo									321	299	7	1
(d) Nagasaki-Ken						48	589	997	547	815	11	
(e) Osaka									4284	1458		
Yokohama and ad- jacent districts							90	456	808	144	20	
<i>Persia.</i>												
<i>Spain: (f)</i> City and province of Valencia					40	104	827	758	558	354	8	
Barcelona									6	14		
Madrid							1					
<i>Sumatra.</i>												
<i>Turkey in Asia:</i> (g) Adana.									72	533	31	110
Aleppo										1		
Alexandretta												
Beirut												50
Erbil								108				
Hamah										242	434	
Homs											273	49
Mersine												2
Mesopotamia.												
Orfa										4		
Tripoli												214

(a) Cases brought from emigrant-ship "Congella." (b) Epidemic began August 5, 1890.
 (c) Epidemic began September 10, 1890. (d) Epidemic began June 27, 1890. (e) 1865 cases reported
 for August, but number of deaths not reported. (f) Epidemic began May 13, 1890; 5493 cases and
 2827 deaths were reported in all Spain during the epidemic. (g) 100 cases and 70 deaths reported
 from November 21 to December 2, 1890; "Hejaz," 4171 deaths from the beginning of epidemic to
 October 19th; province of Mossoul, Mesopotamia, June 22d to July 17th, 191 cases, 120 deaths;
 province of Diarbekir, Mesopotamia, June 17th to July 17th, 148 cases, 114 deaths.

YELLOW FEVER IN 1890.

(As reported to the U. S. Marine-Hospital Bureau.)

COUNTRIES AND CITIES WHERE PRESENT.	DEATHS.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
UNITED STATES:												
(a) Gulf Quarantine	.	.	.	.	1	.	.	1				
Key West	.	1										
(b) N.Y. Quarantine												
FOREIGN:												
<i>Brazil.</i>												
Ceara	2	2	4	6	8	.	8					
Para	1	.	2	8	1	.	6	6	.	.	1	
Pernambuco	.	.	1	.	3	.	1					
(c) Rio de Janeiro	87	65	187	156	71	88	28	29	11	.	.	5
<i>Costa Rica.</i>												
(d) Limon.												
<i>Cuba.</i>												
Cardenas	.	.	.	.	.	4	14					
Cienfuegos	.	.	.	.	.	1	11	8	14	13	9	3
Havana	12	4	4	12	26	45	67	64	31	33	23	12
(e) Santiago de Cuba	.	2	.	.	.	.	.	2	.	4	5	7
<i>Mexico.</i>												
Merida	.	.	2	.	.	6	22	6	1			
(f) Vera Cruz	.	.	.	.	.	1	1	8	1	4	9	19
<i>Spain.</i>												
(g) Malaga.												
<i>U.S. of Columbia.</i>												
Colon	.	.	.	.	.	.	.	.	.	1		

(a) Six cases treated : May, 1; June, 1; July, 2; August, 2.

(b) Case taken to hospital from steam-ship "Santiago."

(c) Reports for several weeks not received.

(d) Nine cases occurred in hospital from January to May.

(e) Reports irregular.

(f) Reports irregular.

(g) Two cases brought from New Orleans in June.

SMALL-POX IN 1890.

(As reported to the Marine-Hospital Bureau.)

COUNTRIES AND CITIES WHERE PRESENT.	DEATHS.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
UNITED STATES:												
* Boston Quar'tine				9								
Chelsea, Mass.						1						
Connecticut	8	2										
Galveston, Tex.												
Half Way, Ky.												
Houston, Texas.												
(a) Laredo, Texas.												
Michigan			4									
New Mexico		2	1			1						
New York.												
(b) Redfield, Ark.												
San Francisco											1	8
(c) Savannah, Ga.												
(d) Searsport, Me.						1						
FOREIGN:												
<i>Africa.</i>												
Loanda		4	1			1						
<i>Austria.</i>												
Trieste					1							
Vienna										1	4	9
<i>Azores.</i>												
(e) Fayal.												

*Cases on barque "Sarah" from Azore Islands. (c) Two cases reported in December.

(a) Ten cases reported on Nov. 27, 1890.

(b) Two cases reported in November.

(d) Case brought from Boston.

(e) Small-pox broke out Jan. 30, 1890.

SMALL-POX IN 1890 (*continued*).

COUNTRIES AND CITIES WHERE PRESENT.	DEATHS.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
<i>Brasil.</i>												
(f) Bahia.												
Jer. de la Frontera . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	2	8	10	1	12	18
Pernambuco	2	4	23	25	54	140	285	446	261	227	94	88
Rio de Janeiro	89	19	20	13	10	. . .	12	12	12	. . .	. . .	27
Rio Grande do Sul . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4	6		
<i>Belgium.</i>												
Antwerp . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1	1			
Brussels . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1	3	3	3	4	. . .	18
Ghent . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1	1
<i>Ceylon (g).</i>												
<i>Chili.</i>												
Iquique . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1	1	
<i>Costa Rica.</i>												
(h) Guatemala.												
<i>Cuba.</i>												
Havana	1	. . . . .	. . . . .	1	2	2	. . . . .	. . . . .	2	. . . . .	3	1
<i>Ecuador.</i>												
Guayaquil . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	59	40	42
<i>Egypt.</i>												
Alexandria . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1	. . . . .	. . . . .	. . . . .	. . . . .	1
<i>France.</i>												
(i) Bordeaux.												
Havre . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1	. . . . .	. . . . .	. . . . .
Lyons . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1			

(f) A few isolated cases reported in June. (g) Twenty-two deaths reported for quarter ended March 31, 1890. (h) January 1, 1890, to Sept. 30, 1890, 22,781 deaths reported. (i) Seven months ended July 31, 1890, 1 death.

SMALL-POX IN 1890 (*continued*).

COUNTRIES AND CITIES WHERE PRESENT.	DEATHS.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
<i>France (continued).</i>												
Marseilles . . . . .	. . . . .	40	58	85	82	37	43	55	22	62		
Nantes . . . . .	. . . . .					1						
Nice . . . . .	. . . . .				1							
Paris	12	9	6	11	9	2	4	5	5	.	2	10
Rheims . . . . .	. . . . .					1						
Rouen . . . . .	. . . . .					.		1				
<i>Funchal</i> . . . . .	. . . . .					19	11	6	2	7	3	
<i>Germany.</i>												
Bremen . . . . .	. . . . .								.	.	.	2
Dresden . . . . .	. . . . .								1			
<i>Frankfort-on-the Main</i> . . . . .	. . . . .								.	1		
Konigsberg . . . . .	. . . . .							2				
Prague . . . . .	. . . . .								.	.	6	4
Stettin . . . . .	. . . . .								2			
<i>Gibraltar</i> . . . . .	. . . . .	2						2				
<i>Greece.</i>												
Piræus . . . . .	. . . . .						18					
<i>Holland.</i>												
Amsterdam . . . . .	. . . . .						1					
<i>India.</i>												
Calcutta	42	144	275	162	13	17	8	7				
Singapore	3	2	.	3	1	.	.	1	.	7		
<i>Italy.</i>												
Genoa	1	9	14	9	21	5	14	8	10	1	1	2
Leghorn . . . . .	. . . . .						2					
Milan . . . . .	. . . . .										1	
Naples . . . . .	. . . . .					5						

SMALL-POX IN 1890 (*continued*).

COUNTRIES AND CITIES WHERE PRESENT.	DEATHS.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
<i>Italy (continued).</i>												
Palermo . . . . .	.	.	.	4	2							
Rome . . . . .	.	1	2									
Turin . . . . .	.	.	.			1	1	1	1			
Venice . . . . .	.	.	.			5	18	36	16	21	28	36
<i>England.</i>												
London . . . . .	.	1	.	.	2							
<i>Mexico.</i>												
Matamoras . . . . .	.	.	.	.	.	.	5	4	1	3	4	4
(k) Piedras Negras.												
<i>Portugal.</i>												
Lisbon . . . . .	.	.	.	.	.	8	.	.	4	10	40	2
<i>Russia.</i>												
Odessa . . . . .	.	.	.	.	.	.	4	1				
Warsaw	60	42	58	74	57	28	45	26	23	31	26	22
<i>Scotland</i>	1	.	1	.	.	1	.	3				
<i>Spain.</i>												
Barcelona . . . . .	.	.	.	.	.	.	4	4	4	.	4	11
Cadiz	24	.	.	.	.	.	18	.	.	.	.	8
(l) Cogollos.												
Lisbon . . . . .	.	.	.	.	.	.	.	.	.	.	.	18
(m) Madrid.												
Valencia . . . . .	.	.	.	.	.	.	2					
<i>Switzerland.</i>												
Zurich . . . . .	.	.	.	.	.	.	.	1	3	4		
<i>Turkey.</i>												
Constantinople . . . . .	.	.	.	.	.	.	16	17	10	.	37	63
<i>West Indies.</i>												
(n) Martinique.												

(k) July 12, 1890, 29 cases reported; Aug. 12th, 14 cases. (l) Fifty cases reported Aug. 4, 1890.
(m) Two hundred and fifty cases reported in letter of August 26, 1890, and 2500 cases reported in city on October 11th, with 50 to 60 new cases each day. (n) Small-pox on board steam-ship "Allianca."

EMBRYOLOGY, ANOMALIES, AND MONSTROSITIES.

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EMBRYOLOGY.

INTEREST in embryological circles seems to have centred the past year in heredity, with the tendency to go over again the whole ground of evolution. The followers of Lamarck and Darwin have assailed each other with their wonted energy, and with as little prospect of reaching any neutral ground. Among the more modern writers of the Darwinian school, Weismann¹¹⁸⁴, holds that the object of sexual reproduction is to supply variations upon which natural selection may operate; that the apparent effects of use and disuse are more probably due to cessation of natural selection, which can no longer maintain the efficiency of the useless part; that the phenomena of instinct seem capable of explanation by the operation of natural selections of blastogenic variations of the nervous system, rather than by the supposed transmission of acquired habits; that the apparent effects of increased use are more probably due to the operation of natural selection upon a part which is, beyond question, of especial importance, combined with the admitted increase which follows increased use during the life of the individual.

E. B. Poulton claims that the evidence in favor of the transmission of acquired characters fails to stand the test of a thorough investigation, and argues against the theory, drawing his conclusions from the facts of individual variation and the effects of instinct. The occurrence of twins and monstrosities leads him to the conclusion that individual variation is predetermined in the fertilized ovum.

Paolo Mantegazza⁹¹³, comes out strongly in support of Weis-
(F-1)

mann in his opposition to the heredity of traumatic lesions. He holds that if the mutilations of organs not essential to life caused inheritance in the offspring of the same mutilation, the doctrine of use and disuse would receive confirmation.

E. D. Cope,²⁴⁸ under the title of "The Mechanical Causes of the Development of the Hard Parts of the Mammalia," follows out the theory that it is habit which has given rise to the change in structure in animals, and not structure which has forced them to adopt special habits. The writer has carried his theory to the evolution of the teeth, and has tried to explain the varying forms on the ground of use and disuse. As to the mechanical causes of the origin of dental modifications, he enumerates the following laws: 1. Increase in size of a tooth, or a part of a tooth, is due to increased use, within a certain maximum of capacity for increased nutrition. 2. The use and change in direction of a tooth takes place away from the direction of greatest, and in the direction of least, resistance. 3. It follows that, from their greater flexibility, crests of crowns of teeth yield to strain more readily than do the cusps. 4. The increase in the length of crest and cusps in all directions (and therefore the plications of the same) is directly as the irritation from use to which their apices and edges are subjected, to the limit set up by the destructive effects of such use, or by the recuperative energy of nutrition.

Regarding the development of molar teeth in the mammalia, he states that they are traceable directly back to the simple conic (hoplodant) reptilian tooth through the following series of evolutionary changes: first, a simple cone, or reptilian crown, alternating with that of the lower jaw (hoplodant type); second, a cone with lateral denticles (the triconodant type); third, the denticles to the inner or outer side of the crown forming a three-sided prism, with tritubercular apex; fourth, development of a heel projecting from the posterior bone of the lower jaw, which meets the crown of the superior, forming a tuberculo-sectorial inferior molar. From this stage the carnivorous and sectorial dentition is derived, the tritubercular type being retained. In laying down the laws and explaining the changes that occur in the evolution of the teeth, the writer¹¹⁸⁷ does not differentiate between the crown and roots of teeth, but considers them as a unit, when it is a well-known fact to embryologists that they are of different sources of origin, the

enamel of the crown being from the epithelial layer, while the root is from the mesoblastic layer; when, again, he ignores the fact that the crown is fully developed before it erupts and comes into function, and, further, that when the crown has erupted, the source of nutrition, so far as development is concerned, has been lost in the changes that occur in the enamel organ, which becomes Nasmyth's membrane. From the stand-point of embryology we have promulgated the following law, which, so far as we know, has never been disproven, viz.: that a tooth once formed and brought into use is subject to only two changes in form,—one by chemical disintegration, and the other by mechanical abrasion; a tooth is so constructed, being a system of superimposed arches in all directions, that impact may not be brought upon its crown to indent or alter its form when once fully formed. Use may affect the roots of continuous growing teeth, and it is possible that the canine teeth may have been differentiated in this manner; but it does not seem possible that the tuberculated molars have by use been formed from simple conic teeth.

The consideration of the question of maternal impressions, which has such a strong hold on members of the profession whose minds seem to incline toward the speculative rather than the utilitarian aspect of science, depends upon the right understanding of the laws of heredity; not only must we consider whether acquired attributes can be inherited, but also whether mental conditions of the mother may be transmitted to the foetus *in utero*. Many claim that they can.

C. Annette Buckel,⁷⁷ gives the question full consideration, and after citing a number of authorities and cases draws the following conclusions: The foetus *in utero* is, physically, beyond the control of the mother; she cannot voluntarily change the growth or function of a single cell. There is no way by which impressions made on the mother's mind can be physiologically conveyed to a particular part of the foetus. If a mother cannot will to alter any part of her own system, how much less can she do the more difficult thing of impressing the foetus, which has an independent life of its own, as far as growth and development are concerned.

The question whether acquired mutilation in the parent can be transmitted to the child is one that often presents itself to the

thoughtful biologist, and is one that perhaps would receive an affirmative answer from the majority of those who are unaccustomed to weigh the value of evidence.⁶ In most works on physiology in which the subject is mentioned at all, it is admitted that impressions made on the mother during pregnancy may affect the offspring, and cases are recorded where the father having a distorted finger from an injury, children were born with similarly distorted fingers, and others where accidental injury to an eye in one parent was followed by some defect of the same eye in the offspring. But when such cases are followed out, it will generally be found that they rest on hearsay, or that the facts have been observed or reported with little attention to the accuracy that is required to render them credible. Darwin, with his usual caution, remarks that some mutilations have been practiced for a vast number of generations without any inherited result, and notes, with Godrou, that different races of man have from time immemorial knocked out their upper incisors, cut off joints of their fingers, made holes of immense size through the lobes of their ears or through their nostrils, tattooed themselves, made deep gashes in various parts of their bodies, and yet that there is no reason to suppose that these mutilations have been inherited. He refers, indeed, to the well-known experiments of Brown-Séquard, in which certain guinea-pigs transmitted epilepsy to their descendants after injury to the spinal cord; whilst others (after injury to the sciatic nerve, leading them to gnaw off their own toes) gave birth to toeless guinea-pigs; but after alluding to many other cases recorded of cats, dogs, and horses which have had their tails or legs amputated or injured, producing offspring with the same parts ill-formed, he remarks that as it is not very rare for such malformations to appear spontaneously, all such cases may be due to coincidence.

Weismann,¹¹⁸⁴ in an essay on the supposed transmission of mutilations, expresses himself in much stronger terms. He points out that if mutilations must necessarily be transmitted, or even if they might occasionally be transmitted, a powerful support would be given to the Lamarckian principle, which is to the effect that a change in the structure of any part of an organism is chiefly brought about by exposure to new conditions of life inducing a change in habits; and this again leads to hypertrophy or atrophy of certain parts, and the modified parts are then transmitted to the

offspring. On this principle, Lamarck explained the long neck and the webbed feet of the swan, and the degeneration of the eyes in the proteus. Weismann refers to several frequently-cited cases, and shows that they either rest on insufficient evidence or that their occurrence may be explained in other ways. Thus, in the case of the tailless breed of cats in the Isle of Man, there is no evidence to show when or how it commenced; indeed, it is probable that it is the outcome of a gradual process of reduction of the length of the tail, since a similar breed is found in Japan, and preserved from an idea that such animals are better mousers; whilst the number of vertebræ that are suppressed may be as many as ten. He tells a good story showing the care that should be exercised in admitting the spontaneous origin of such anomalies. Last summer Schottelius, of Freiburg, brought to Weismann a kitten with a congenital rudimentary tail, which he had accidentally discovered as one of a family of kittens at Waldkirch, a small town on the southern part of the Black Forest. The mother of the kitten possessed a perfectly normal tail; the father could not be identified. A closer investigation resulted in the following rather unexpected discovery. For some years past tailless kittens have frequently appeared in the families of many different mother-cats at Waldkirch, and this fact is explained in the following manner: A clergyman who lived for some time at Waldkirch had married an English lady who possessed a tailless male Manx cat. The probability that all the tailless cats in Waldkirch are more or less distant descendants of that male cat almost amounts to certainty, and Weismann goes on to say since a male Manx cat has reached the Black Forest it might equally well arrive at some other place. In order to obtain experimental evidence on the point, Weismann mutilated a number of white mice by cutting off their tails. As the families were successively born the tail of each member was cut off, until in the course of about fifteen months 901 young, produced by five generations, had been thus mutilated. Yet not only was there no instance of a tailless mouse being born, but in none was the tail shorter than 10.5 millimetres, the tail of a newly-born mouse varying normally from 10.5 to 12 millimetres in length. This result does not, indeed, prove that mutilations might not be inherited, but it does militate against the commonly-accepted view that the mutilation of an individual is likely to be transmitted to

the very next generation. The subject is one of much interest, and those who happen to meet with well-marked and well-authenticated instances of inheritance, if such cases ever occur, would do well to record them.

ANOMALIES.

Head and Thorax.—J. Morgan,² mentions a tuft of hair in the middle of a boy's forehead, evidently hereditary, as it could be traced through four generations. C. Kiwall,²⁵ describes a singular instance of congenital hypertrophy of half of the face. The case was that of a girl 18 years old, the right side of whose face had increased enormously. The microscope showed the abnormality to be due to an increase of fatty and connective tissues. J. Clair-horne,¹ mentions a case of supernumerary tonsil on the left side of a young woman, whilst on the right there was a hiatus of the internal pillar of the fauces, thus showing at the same time an arrest of development on one side with an overdevelopment on the other. Lombinon²⁵⁶ reports a case of meningo-encephalocele in a boy 14 years old. The tumor was seen in the suboccipital region, as large as a medium-sized orange. There was also a malformation of the cranial bones. A girl is described by F. Edsall¹⁶¹ whose left auricle showed marked arrest of development, the meatus being represented only by a slight depression. Hearing on this side was absent. C. Parkhill¹⁵⁵ tells of a man who has had three distinct sets of teeth in succession in the incisive region. In this case also the clavicles are rudimentary, there being only an inch of the sternal end of each. A somewhat different case is that reported by Idelson.¹⁰⁹ A young Russian recruit was found to have no less than three regular and complete sets of teeth, one behind the other, on both his upper and lower jaws. R. Sabourand²⁵ describes a specimen of cleft palate in which the dental evolution presents the typical form of Albrecht. A most marked fissure of the palate is described by Delalain.¹⁰⁰ The cleft extended back so far and was so deep that the sphenoidal sinus was easily reached. A case of cleft lower lip is described by A. Wölfler.² The cleft extended below the chin, involving the neck.

R. Johnson² relates two instances of persistent thyroid duct, the one in a girl of 15, the other in a girl of 6. In one case the sinus opened 2 inches above the sternum; in the other, just over the thyroid cartilage. Both ducts discharged mucus, and in

both cases operative measures were successful. H. Darcy²⁸² attended a woman in her sixth confinement whom he found to have in each axilla a well-developed breast except that each was destitute of a nipple. During the latter part of pregnancy and after confinement, considerable milk was discharged through openings in the areolæ, causing great annoyance; but she had been in the habit of stopping the secretion by the application of a saturated solution of common salt.

T. Dwight²⁷⁷ writes an interesting paper on irregular union of the first and second pieces of the sternum in man and apes. A case of congenital absence of five ribs, from the sixth to the tenth, inclusive, is reported by H. Gage.¹ The absence of bony support has resulted in marked curvature of the spine. The heart was felt on the right side, and, during the act of coughing, a tumor appeared on the left side, which was probably a hernia of the stomach.

B. Henderson²¹⁸ showed to the Glasgow Pathological Society a man of 60 years of age, with congenital absence of portions of the recti abdominis muscles, thus allowing the intestines partly to protrude, and their movements to be easily seen through the thin partition.

A case of congenital defect of the pectoral muscles is mentioned by J. Ruckert.³⁴ A somewhat similar defect in the muscles of a sculptor is described by Brieger.⁴¹ L. Bruns and L. Kriedel⁵⁴ have an interesting dissertation on the subject of defects of the pectorales and serratus ant. major muscles, with mention of an instance of their absence on one side. Another instance of congenital defect of the right serratus anticus major is reported by O. Pierung.⁷⁵ Nazaris¹⁸⁸ and Géry⁵⁷⁷ describe interesting anomalies of the median nerve. Ledouble⁷⁸ found a pre-sternal epigastric muscle in 33 out of 722 subjects which he examined, the anomaly being oftener found in foetal than in adult life.

Heart and Circulatory System.—A child²² is mentioned in whom the sternum and costal cartilages are so imperfectly developed that the heart can be distinctly seen through the thin cutaneous wall of the chest, the shape and size of the auricles and ventricles being almost as visible as if exposed to view. At Nothnagel's clinic⁹ was shown the body of a boy, 8 years of age, who

had died from pulmonary haemorrhage. Both right and left auricles were found opening into the left ventricle, the ventricle being very small, and merely an appendage of the pulmonary artery.²¹¹ Audry and Lacroix report the case of a 2½-day-old child whose heart at the autopsy was found practically to consist of one auricle and one ventricle, as the ventricles were connected by a large opening, as were also the auricles, the left one of which was rudimentary.

Patent Foramen Ovale.—Dorning⁵¹ details a transposition of the aorta and pulmonary artery with patent foramen ovale. The patient, a boy of 10 years, died suddenly, after having exhibited during his life-time considerable cyanosis, weakness, and frequent attacks of syncope. W. Haw⁶ describes a case in a child who died at the age of 14 days. Another case is reported by W. Greenfield.²⁵

Dextrocardia.—Grunmach⁹⁰ gives an interesting account of a boy who lived to the age of 15. There were also deficiencies in the septum of the heart. During the first year of his age nothing abnormal was noticed, but after that he developed considerable dyspnoea and cyanosis. At the age of 13 he had an attack of pleurisy, and during the last six months of his life suffered much from repeated attacks of haemoptysis and died after a severe attack. At the autopsy the condition noted above was found, but without the usually accompanying situs viscerum transversus. L. Holt⁵¹ details the case of a child that died at 15 months of heart-failure, due to an attack of pleuro-pneumonia. The heart was found to be situated on the right side, and to consist of two auricles and one ventricle. There was merely a slight sign of the septum ventriculorum, dividing the ventricular cavity into two unequal portions, of which the left was a rudimentary ventricle. There were three openings in the right portion: above, the tricuspid orifice; below that, the pulmonary, a quarter of an inch in diameter; and below this the mitral orifice. The aortic opening was at the upper part of the common ventricular cavity.

In the case reported by J. Crook,⁶¹ he found, in addition, entire absence of the right lung, whilst the left was studded with tuberculous deposits. The patient, a man, had died suddenly, at the age of 36 years. S. Swan⁶, mentions a boy under his observation with this condition, who is suffering from phthisis.

Another case is reported by Graanboom.¹¹⁴ A singular case is related by N. Fried.⁵⁷ A man who had been a sailor died suddenly from hernia of the diaphragm. This, though congenital, had never caused him inconvenience, and had not prevented his passing the rigorous examination required for naval service.

H. Malieff reports an anomaly of the right subclavian artery. It proceeded directly from the aorta, turned to the left, then upward, next to the right, between the oesophagus and spinal column, and finally over the summit of the right lung to its normal position. An almost similar anomaly of the right subclavian is mentioned by W. Thompson.¹⁶ Meigs¹ found the opening of the right coronary artery directly in the angle between the right coronary and intercoronary flaps. A number of anomalies are noted by J. Cilley¹²⁶ in the distribution of the brachial, ulnar, and radial arteries, and their different branches. J. Anderson⁵⁹ reports a case in which the right external carotid consisted merely of a short axis of fine vessels corresponding to the branches of the external carotid.

J. Clark²⁷⁷ showed a heart that presented four pulmonary valves. Primrose³⁹ showed to the Pathological Society of Toronto an interesting variation in the vessels arising from the arch of the aorta. The first branch bifurcated, when $\frac{1}{2}$ inch long, into the two common carotids; the second was the left subclavian, abnormal in position; the right subclavian arose from the posterior aspect of the aorta, and also pursued an abnormal course.

Alimentary Tract.—An interesting case of stricture of the duodenum is reported by J. Emerson.⁵¹ A well-formed infant died at the age of 4 days, during which time it refused to nurse, and was fed small quantities of brandy and milk. At the necropsy the duodenum was found to end suddenly just above the orifice of the common bile-duct, so that neither fluid nor air could be passed beyond that point. A case of diverticulum leading from the oesophagus is mentioned by Unverricht.²¹ T. Diller⁹ relates the interesting condition found in an autopsy on the body of an insane woman of 64. A diverticulum 4 inches long and $\frac{1}{2}$ inch in diameter was found proceeding from the ileum at a point 2 feet above the ileo-caecal valve. The large intestine presented marked differences in lumen, due probably to habits of constipation,—a condition he had several times noticed in autopsies on the insane. J. Coven³⁹ showed to the Pathological Society of Toronto a speci-

men of Meckel's diverticulum. Two others are mentioned by Birmingham. ¹⁶ Rogie ²²⁰ reports a large sigmoidal recess.

Boyd ³⁶ describes a child that was brought to the hospital a few hours after birth because it was found to have no anus. An incision $2\frac{1}{2}$ inches deep failing to find the rectum, inguinal colotomy was resorted to. The child died in a few days, however, and at the autopsy the sigmoid flexure was found to open into the bladder. F. Epley ¹⁰⁵ records an almost identical case. The child was moribund when he saw it, and died in half an hour. The rectum in this case ended blindly, slightly below the upper border of the sacrum. In the case reported by Munn ⁹, the child lived five weeks, passing both urine and faeces at first through the penis, then through the umbilicus. The rectum was found to end in a *cule-de-sac*, which was connected with the bladder by a fistulous opening. In the 2 cases described by S. Paget, ⁶ and the 1 by F. Edge, ⁶ inguinal colotomy was tried, but the children, as in all the cases reported, died. Brown ⁵¹ showed the New York Academy of Medicine a specimen of this condition. Ziegenspeck's case ² was especially interesting from the fact that the rectum ran along under the integuments of the perineum, to open by a narrow orifice under the root of the penis.

J. Coats ²¹⁸ describes a case of ectopia viscera, in which there was a fissure from the umbilicus downward, allowing a sac to protrude which contained the intestines and a portion of the liver. There was also exstrophy of the bladder. The umbilical cord was bifurcated, one portion containing an artery, the other an artery and a vein. Dakin ², also showed a case of ectopia viscera to the Obstetrical Society of London.

An account is given by C. Gaskin ², of complete situs viscerum transversus, noted in the body of a boy of 18, who died of tuberculosis. Cheadle ² demonstrated a case in a boy of 13, who had been sent to the hospital for phthisis. J. Cleaver ¹⁰⁶ found this to be the anatomical condition in the body of a man who died suddenly, and who always had been cyanotic, sickly, and weak. Another case is reported by S. Baumgarten. ¹¹⁸

Klein ² found a large spleen in the utero-vesical pouch of the body of a woman who died at the age of 63. D. Hurd ¹⁹² describes a child whose umbilical cord was attached to the abdomen at two places, the bifurcation uniting when about $2\frac{1}{2}$ inches from the ab-

domen. The child urinated from the navel for several months at the same time that it did through the urethra. Zumwinkel² mentions the case of a girl of 7, who since birth had a small fistula at the umbilicus, from which mucus issued. The cyst to which this led was removed, and from its structure he regarded it as a remnant of the vitello-intestinal duct. Törngren, of Finland,¹⁰⁰ describes a rare case of congenital cystoma in the coccygeal region in an infant of 6 months. The growth increased rapidly after birth. It was enucleated and the wound healed kindly, but the child died shortly of diarrhoea and nervous exhaustion. Jakouleff⁹⁸ describes a rapidly-growing tumor in the sacro-coccygeal region of a child of 3 months. The growth was safely removed, and was thought from microscopical examination to represent a parasitic foetus. Two very interesting cases of somewhat similar character are described by Bohosiewicz.⁵⁰⁰

Genito-Urinary System.—V. Gauthier², describes an instance of precocity in a boy of 7 years, whose genitals were as large as those of an adult. The pubes and scrotum were covered with abundant hair, and his voice was quite base. Crinelle⁸, more than matches this with a female child of 18 months of age, whose breasts were as well developed as those of a girl of 16 years of age. The child had also wide hips, prominent mons veneris, and a relatively enormous clitoris. She had already menstruated three times.

A number of cases of hermaphroditism have been reported the past year, of which perhaps the most interesting is that of O. Rosenthal.²² The patient had first been regarded as a girl and given a girl's name, but at the age of 12 years the name Hermann (!) was substituted for that of Sophie. The appearance simulating female genital organs was found to be a divided scrotum, one side of which contained an intestinal loop, the left being empty, double cryptorchidism existing. Decker's¹⁰⁰ case is somewhat similar. This patient was a supposed girl of 12 years of age. There was a well-formed penis and scrotum, but the urethra opened just below the scrotum in the upper cleft of the vaginal chink. Labia majora were present, but no labia minora; nor could vagina or uterus be demonstrated. The case reported by W. R. Smith²⁷ of a frog is peculiar, from the fact that the right side of the body of the animal exhibits very completely the male charac-

teristics with some of the female, whilst the left side shows the female characteristics with some of the male. Other cases are mentioned by Oswald Latter, ²⁷⁷ G. Winter, ¹³ Debout, ²⁰⁸ Egeá, ¹⁷⁹ G. E. Armstrong, ²⁸² K. A. Herzfeld, ⁸⁴ and C. W. Fitch, ¹ whilst G. Lepage ⁸⁴⁵ devotes an interesting article to the discussion of the subject.

Birmingham, ¹⁶ exhibited a rare curiosity in the shape of a single unilateral sigmoid kidney. In 12,978 autopsies made in London, only one such kidney has been found. Another instance of fusion is mentioned by A. Kruse. ⁸⁴ There was a double hilum, with two arteries, two veins, and two ureters, but no indication of the common horseshoe shape. Potain ⁸ describes displacement of the kidneys by anteversion. C. Pelton ⁷⁰⁰ found in an autopsy on a man who died of enteritis, congenital absence of the left kidney and ureter.

A child is described by McKay, ²⁸⁴ which was found to have the umbilical cord attached some 4 inches below the usual place and to the upper border of the bladder, which was in a condition of exstrophy. No penis was found, though the scrotum was present, with one testicle. The urine dribbles constantly from two little openings situated an inch above the pubes, and an inch and one-half apart. Another case of exstrophy of the bladder, reported by Edgar Willett, ², is especially interesting from the fact that the patient lived to the age of 60 years.

A. W. Steen, ⁴⁰⁰, showed a unique specimen of malformation of the urethra. The patient, a young man, had died of phthisis, whilst the surgeons were contemplating urethrotomy for a supposed impassable stricture. About an inch in front of the membranous portion the calibre suddenly diminished to about 15 millimetres in circumference, and remained thus to the vesical orifice. Amand Routh, ², reports 3 cases of urethral diverticula.

Fenwick, ⁶, showed to the Medical Society of London 2 cases of complete epispadias. Rauber, ²⁰² recently discovered a very singular defect, viz., lack of penis in a man of 38 years. Scrotum and testicles were found, but the urethra opened into the rectum.

A. Primrose, ⁸⁹, reported to the London Medical Society at length an interesting case of imperfect cryptorchidism, complicated with omental hernia, for which he successfully operated. A similar case with similar result is mentioned by F. Greene, ².

An interesting case is reported by Surgeon-Major Jaubert ²⁰⁶ _{Aug., '90} of a Mohammedan who applied for relief of a difficulty in micturating. From pubes to anus was found a smooth, unbroken surface, with the exception of a median linear cicatrix, one portion of which was a minute opening, which acted as a meatus urinarius. It was discovered that the patient was a male whose genital organs had been removed,—a species of mutilation formerly of frequent occurrence. A case of rudimentary glans penis is reported by J. H. Dunn ¹⁰⁵ _{J. M. S.} in a man 45 years old. The glans was the size of a small pea and had in its centre a minute meatus.

Brodnax ⁸¹ _{Dec., '90} tells of a woman whom, at the time of her sixth confinement, he found to be possessed of two uteri, one posterior to the other, and each with its separate vagina. The posterior was the smaller and had evidently never been impregnated, though it probably had normal appendages, as the woman menstruated regularly, whether pregnant or not. A somewhat similar case is related by Wallace. ²⁵ _{Nov., '20} J. P. Dodge also publishes a case. ¹⁰⁵ _{Oct., '91} Burns ¹⁶¹ _{Mar.} describes at length a bicornate uterus with double vagina.

A. Currier ²⁷⁵ describes a case of uterus bicornis unicollis, the condition having been discovered whilst an abdominal section was being performed for the relief of uterine adhesions. Rochet ²⁵⁶ _{Jan., '90} found this condition at an autopsy on the body of a 15-year-old girl. Ballantyne ³⁶ _{J. M. S.} showed to the Edinburgh Obstetrical Society a specimen of uterus bicornis septus.

L. H. Dunning ⁶¹ _{Aug., '90} reports a case of uterus bilocularis discovered in a woman who had aborted at three months. The case reported by W. B. Chafin ¹ _{Sept., '97} is especially interesting from the fact that both compartments were pregnant at the same time; one aborted at four months and the other a month later, when the foetus had reached the age of six months.

King ² _{Nov., '90} reports a case of double vagina, in which the right organ led to the cervix uteri, whilst the left was a *cul-de-sac*.

Van Eman ¹⁰² _{Apr.} reported to the Kansas City Medical Society the case of a woman of 22, who applied to him for an examination on account of inability to perform coitus. A shallow pocket ¹/₈ inch deep just below the meatus was the only sign of a vagina. Neither uterus or ovaries could be found. Since there was only a thin septum between the bladder and the rectum, she was dismissed as a hopeless case. More fortunate in termination was the case

reported by Newman.⁷⁹ There was no vagina, and only a rudimentary uterus, and the urethra had been greatly dilated in attempts at coition. As the husband was meditating divorce, the wife was anxious for an operation. An artificial vagina was accordingly made, which remained patent, and from subsequent events evidently proved satisfactory. Aleska¹⁰⁹ mentions the case of a woman with absence of the uterus, the vagina being represented by a small, funnellike opening. The patient admitted strong sexual appetite, but no satisfaction from cohabitation, often fainting after the act. Stepkowski⁸⁴ details an interesting case of a girl of 22 who came to him on account of syphilitic warts on the labia majora, and who was found to be entirely destitute of vagina, uterus, and ovaries. Notwithstanding this, she had had connection through the urethra with several lovers, experiencing intense voluptuous sensations, and had received as a legacy from her first lover the case of syphilis. P. D. Borshtchoff²⁵ reports 2 cases of complete absence of uterus and ovaries, the vagina in each case being simply a blind pouch. Neither woman had sexual appetite or voluptuous sensations on coition. Other cases reported are those of Gaudecher,²⁴ M. MacLauren,²⁸⁴ C. Jacquemard,²²⁸ Brennan,¹²² Martin,¹⁸ Picque,²⁴ and Liebmann.⁸⁴

A case of malformation of the genital organs of a female foetus seems to Shattuck² to bear out Leuchart's view that the vesicula prostatica represents both the uterus and vagina, and also to demonstrate that the orifice of the hymen might be looked on as the narrowed aperture by which the vagina communicated with the uro-genital sinus. D'Hotmann de Villiers²⁹⁸ describes the case of a woman of 21, in whom the labia minora were wanting and the labia majora but slightly developed.

Three cases of lactation in the male are reported. The one mentioned by W. J. Mayberry¹⁸⁶ had occasionally a small amount, whilst that reported by R. G. Mauss¹⁸⁶ had an abundant secretion of milk. W. M. Donald tells of a young man of 21, whose mammae were of normal size, but whose secretion was so copious that pressure on the breast would cause the milk to squirt several feet. A correspondent,⁸², too modest to give his name, reports a case of menstruation in the male. The man had a slender waist and feminine disposition, but a good growth of beard. He is married, and has one child. His external genitals are quite

normal, but every month he experiences for three or four days a discharge from his penis, which is strongly tinged with blood, and during this time he suffers from severe headache and the general malaise common to females at this period. Another case of lactation in the male is reported by E. B. Perelswig.²⁸ It is that of a young Hebrew laborer of 18 years of age, whose breasts are exactly like those that are met with in an average well-made girl of 16.

Extremities.—Chaliex⁹⁰ describes a female patient in the Maternity Hospital whose hands exhibit at the same time the four types of congenital deformity, namely: (1) electrodactylism,—abnormality from absence; (2) brachydactylism,—incomplete development; (3) syndactylism,—union of digits; and (4) clinodactylism, modification in the direction of the bones of the finger. An interesting case of absence of both hands is reported by Finlayson.⁵¹ The bones of the forearm were shorter than normal, and the only traces of hands were small, wart-like projections on both stumps. The case was particularly interesting on account of the singular ability with which the child handled these stumps. Two cases of congenital amputation of the right forearm are reported by Longial.²²⁰ One is a boy of 4, the other a girl of 6 years. In both cases the upper half of the bones remain, well developed, and both freely use the stumps. W. Carr,¹ mentions a case of congenital malformation of the fingers, in which several of the fingers showed intra-uterine amputations, and others had annular constrictions. Wilkie²⁷⁷ details a case of malformation, evidently of hereditary cause. A case of supernumerary digits is related by Patterson,⁶⁴⁵ in which there was on each little finger a supernumerary digit. G. Smith⁶ mentions a case of supernumerary toe. F. Harris² exhibited to the Manchester Pathological Society a girl of 8 years of age in whom the proximal and second phalanges of each hand, as well as several of the toes, were markedly enlarged from dactylitis. K. Basch⁸⁴ describes a 4-day-old child possessed of a host of deformities and malformations, among which was syndactylism between the thumb and index finger. Mauny⁷ reports a supernumerary thumb, and Guermonprez²²⁰ gives an instance of six digits on each hand and foot. P. Ehrhardt⁸⁵³ reports 2 interesting cases, 1 of congenital absence of the thumb and its metacarpal, and the other a congenital amputation of the left great toe. Other cases of supernumerary digits are

related by W. Wallace⁶ and George Thorpe.⁶ A curious deformity in a child of 5 was exhibited by W. Pyle. The first and middle digits of both hands and feet were absent, whilst the third and fourth were webbed together. Schwing, of Prague,² delivered a woman of twins, one of which had the legs united down to the heels, whilst the upper part of the body was well formed. The external genital organs were wanting. A case of partial defect of the radius was exhibited by Dohrn.⁴ The patient, a woman, had the left thumb wanting, forearm shortened, and ulna hypertrophied. Morie Matta⁸⁵³ reports a case of congenital absence of tibia of the right leg, along with a number of other abnormalities of the feet. McLaren³⁶ showed to the Edinburgh Medico-Chirurgical Society a specimen of congenital absence of the tibia. At the same time Thompson³⁶ exhibited a cast of congenital absence of the radius on both sides. J. Ridlon⁵¹ reports the congenital absence of the left fibula in a child of 8 years of age. Bland Sutton⁶ exhibited to the Pathological Society of London a specimen of half vertebra in a rabbit.

MONSTROSITIES.

Double Monster.—Debierre and Dutilleul⁴¹⁰ describe an interesting case of this kind observed by them. The cut on page 17 illustrates the monstrosity.

Acephalus.—H. J. Balt²⁷ presented to the Obstetrical Society of New York a singular specimen, which he claimed to be of a lower degree of organization than has before been found in woman. Gault saw two such growths in cows, and was the first to give a good description. The body is an irregular, ovoid mass, having at one end the insertion of the umbilical cord, and at the other a nude place surrounded by a shallow furrow, presumably the suggestion of an anus. A few irregular bones are the only suggestion of a skeleton. The interior of the body is made up of cellular tissue, serous fluid, fat, and a few blood-vessels. On this specimen there are nine small, shapeless protuberances, some of which he considers rudimentary extremities. This anomalous monster, like most others of similar character, was the result of a twin pregnancy.

Acephalobrachia.—Morgan¹⁸⁷ describes a monster of this variety. Besides having neither head nor upper extremities, the

skin was very thick and œdematos, and on each side, from the spinal aponeurosis to the linea alba, was found a cavity filled with spinal fluid.

Anencephalus.—J. M. Witherow presented to the Cincinnati Academy of Medicine,⁵³ a fœtus whose only indication of a cerebrum was several nipple-like projections back of the bridge of the nose. The head was sessile on the shoulders. Edwards¹²⁰ describes a case which lived two days. Budin²⁴ reports a case in which there was total absence of the cranium; instead of neck, a slight fissure in front and nothing behind; the scalp wanting; the ears and cervical vertebræ deformed. F. M. Green⁹ details the birth of twins, one of which was found to be destitute of parietal and occipital bones, and in which the cerebral hemispheres were only partly developed. Guéniot¹⁰ mentions an anencephalic fœtus of 8 months, having, in addition, considerable deformity of the face due to numerous adherent amniotic bands. Another case is reported by H. C. Hodges,² in which there was also ectopia of the viscera. Two additional cases are reported,⁴⁶ the first a female fœtus of 6 months and the second a fœtus of 8 months, having also anus imperforatus, electromelia, double origin of aorta, intra-ventricular communication, and absence of external auditory meatus.

Exencephalus.—Drain and Chaput⁷ relate a case in which there was absence of the forehead, and through an opening at the top of the cranium projected a reddish mass, the size of a turkey's egg, formed by the brain.

Hydrocephalus.—Faguet, Vergely, and Bitot,¹³⁹ respectively

DOUBLE MONSTERS.

(*Archives de Physiologie, Normale et Pathologique*.)

report cases of hydrocephalus: the first, a 7-year-old boy; the second, a 10-year-old boy, born of syphilitic parents, who, in spite of the deformity, is very intelligent, and speaks three languages; and the third, a young man, who has also spina bifida, but who is likewise intelligent and well developed. A case is described by Maygrier¹⁰⁴ as having both hemispheres consisting of a pulp-like mass. There were also certain deformities of the limbs. Mackness⁸⁶ describes a foetus in which this condition was complicated with meningocele, and which lived to within a week of full-term pregnancy.

Pseudocephalus.—W. Pennell¹⁰⁰ reports the birth of a monster of this variety that lived seventy hours, neither crying or taking nourishment. The frontal, parietal, and greater portions of the nasal, temporal, and occipital bones were wanting, the scalp being drawn tightly over the remainder.

Acrania.—W. Burt⁸⁹ showed to the Pathological Society of Toronto a specimen of acrania, saying that he had attended three such cases. All had lived a short time, and in each case hydramnios was present.

Cephalhæmatoma.—Hirst⁹ reports 2 cases in which there existed double hæmatomata in newborn children.

Porencephalus.—Connolly Norman¹⁶, read before the Royal Academy of Medicine in Ireland a paper on this subject, detailing a case in his own practice. The patient had exhibited partial right hemiplegia and had been a criminal. The brain showed a large opening in the left side, leading directly into the lateral ventricle, the insulæ, operculum, and internal capsule being absent.

Anophthalmus.—A. Saylor⁷⁶⁰ mentions a child born without any sign of eyes, and, being a believer in maternal impressions, he traces it to the circumstance that the mother six months before the birth of the child became totally blind, regaining her sight, however, twelve hours afterward.

With regard to maternal impressions, which, as may be supposed, figure largely in the accounts of monstrosities, Lambeth, another believer,⁸² describes a male child whose "every feature resembles that of a much excited, but harmless cow." In this case the mother remembered that in her third month she was frightened at an encounter between her husband and a cow.

Microcephalus.—Guéniot⁵¹ presented to the Paris Academy of

Medicine a child, 8 days old, whose cranium appeared to be entirely destitute of both fontanelles and sutures. Experience has shown that, although such a child may live a certain time, the intellect does not develop.

Bicephalia.—A specimen ⁸³ was exhibited at a meeting of the Society of Missouri Valley. Fischer¹⁸⁹ describes a double monster which he calls a dibrachic, dicephalic, hæmacephalic monster. It consists of a duplication of the head and upper part of the vertebral column. The two heads are not only contiguous but are united laterally. There is an ear on each outer side, and the other two ears are united in the line of connection. He remarks that the monster might have lived had it not been for the hæmacephalia.

Cyclopia.—Bock ⁸⁴, describes a case of atypical character, in which only the right bulb and right optic foramen were developed. Two more cases are detailed by Stybz, ⁸⁴, one a simple case of cyclopia and the other accompanied by numerous other malformations.

Sternopagus.—An interesting case of this variety of double monstrosity is described by A. Fernandez.⁵ The monster, born dead, was found to consist of two male bodies of nearly the same size, united throughout the whole length of the sternum and part of the abdomen. There was a single placenta and cord, and from between the two bodies protruded a very large single liver. J. Fraser,²⁷ also describes an instance. The bodies were united by the umbilicus, and had a common cord. There were four perfectly-developed hands and arms, legs and feet. Another case is mentioned by H. Robinson, ²⁸ in which the feet were deformed and the single cord bifurcated about 4 inches from the monstrosity.

FISCHER'S CASE OF BICEPHALIA.
(Medical Standard.)

Condamin ²¹¹ showed a sternopagous foetus of 6 months. Owing to a non-union in the median line, each foetus presented a sternum, with but, however, a single umbilical cord.

Cephalo-Thoracopagus.—Zimmerman ⁴¹ reports a monster having perfect union of the neck and chest and partial union of the heads. The viscera were double from the umbilicus downward. There were also two stomachs.

Synotis.—Castaings ¹⁸⁸ reports a double foetus of $7\frac{1}{2}$ months joined by their faces and upper part, the portion beneath the umbilicus presenting two bodies.

Parasitic Foetus.—G. Thompson ¹²⁹ describes an interesting specimen of the abdominopagous type. The autosite is well developed. The parasite lacks head, neck, four upper dorsal vertebræ, and arms. The genital organs are well developed, and about the same quantity of urine is passed as from the autosite. The lower limbs are perfect, except that the knees are fixed by ankylosis. The parasite is attached to the left upper and outer side of the autosite by what appears to be a fleshy union, some $2\frac{1}{2}$ inches in diameter. No heart- or lung- sounds can be heard in the parasite. At the time of writing, the monstrosity was enjoying the best of health. C. Fuller ¹⁸⁸ describes a monster of the thoracopagus parasiticus class. Two interesting cases are reported by Bogdan ²²³: the first, a girl of 15 months, with two supernumerary limbs attached to her pelvis, one of which is well developed; the other case, a male infant of 13 months, with a supernumerary lower limb attached to its back on the seventh and eighth dorsal vertebræ. Both children died after the amputation of these growths.

Ischiopagus.—E. Walker ⁶¹ records the birth of a case which lived 26 hours, during which time, according to the midwife, "both ends took milk greedily."

Phocomelis.—Hirst ¹¹² describes a specimen of this rare form of monster. Though the appearance is as if hands and feet were growing directly from hips and shoulders, yet there is no doubt that all long bones are present.

Amelus.—A child is mentioned by D. H. Cook, ², whose head and trunk were perfect, but whose arms were represented by only one-fourth of each humerus, and whose legs were marked by a fleshy corpuscle, resembling, to a certain extent, the toe of an infant. Jewett ²⁷ showed to the New York Obstetrical Society a

foetus destitute of one lower extremity, and with only thigh and tibia of the other.

Achondroplasia.—Porak¹⁹⁴ reports several cases of adults with *achondroplasia*, which consists mainly of rachitis and osseous syphilis, as he proves by dissection and microscopical examination.

One of these cases was a woman of

PORAK'S CASE OF ACHONDROPLASIA.
(Bulletin et mémoires de la Société obstétrique et gynécologique.)

27, who always enjoyed good health, being possessed of medium intellectual faculties and intact muscular power. She was small, but her trunk and head were those of a full-grown adult. The upper and lower extremities were very short, but with no abnormal curves; the articulations were large. The pelvis was so con-

tracted in all its diameters that in one confinement the child could not be delivered without cephalotripsy. The second time a Cæsarian section had to be made, from which she died, giving birth to a living child presenting all the characteristics of achondroplasia.

Lithopædia.—Schotte,³⁴ describes a case of this rare occurrence. It was that of an extra-uterine pregnancy, and the fœtus had remained within the body of the mother for about 34 years.

Exomphalismus.—Fritts mentions a case that occurred in his practice. The opening in the abdomen is about 1½ inches in diameter, and is to the right of the attachment of the cord. Through the opening protrudes a sac composed of amnion and peritoneum, and containing the intestines, liver, and stomach. A similar instance is reported by Simpson.³⁵ In the case described by Brown,³⁶ the anterior aspect of the abdomen was covered by serous membrane only. There was also in both groins a diminutive penis and scrotum.

Aplasia.—Mansfield describes a singular monster born with a normal twin. All the tissues were swollen. The right side of both abdomen and thorax was occupied by a tumor filled with spinal fluid. The right arm was united to the side of the abdomen, the radius and ulna being the only bones present; the left arm was adherent to the thorax as far as the elbow. Eyes were wanting, and the only internal organs were the heart and about 12 inches of intestine.

Caudal Formation.—Four cases are described by Oscar Shaeffer,³⁷ in which there were also deformities of the extremities.

ANATOMY.

BY JAMES K. YOUNG, M.D.,
PHILADELPHIA.

OSTEOLOGY.

The Ossification of Bones.—J. Janosik⁸⁸² has recorded the result of some extended observations upon reptiles, amphibia, birds, and particularly upon man, in which he emphasizes the importance of the blood-vessels in the formation of bones. The most important part of the process follows directly from the commencement of the blood-vessels. His observations confirm the fact that the definite form of the bones is constructed through resorption and the formation of new bone-structure brought to the part, and he emphasizes the fact that where myelo-plaques are observed, these being specific resorbent organs, absorption has already begun.

Odontoid Process Distinct from Axis of Vertebra.—Sir William Turner showed²⁷⁷ a specimen of the separation of the odontoid from the body of the axis, which is interesting from a morphological point of view, as showing how distinct they are in their development, and that the odontoid process is a true vertebral body. Both bones were slightly modified by additional bony processes,—provisions for giving additional security to the process, so as to some extent stand in the stead of the customary ankylosis, and to give comparative security to the odontoid, as a point about which rotation of the atlas and head might take place.

Possible Origin of Wormian Bones.—G. B. Howes exhibited before the Anatomical Society of Great Britain and Ireland²⁷⁷ the vertebral skeleton of a fire-toad, and drew attention to the resemblance between the paired condition of the os antiepilepticum and its intercollation between the frontal bones, as compared with the paired interparietal of Natharius and its intercollation between the parietals. The first named lay wholly within the area of the normal parietals, and he regarded them as dismembered portions of these bones, indicative of that process of fragmentation (of which

one specimen appeared to show additional traces) which may in rare instances lead up (in man) to their replacement in a tessellated series of Wormian bones.

The Inca or Interparietal Bone.—Marimo,⁹¹⁸ finds that the interparietal bone is rare in healthy Europeans, but more common in less civilized peoples and in insane persons. The præinterparietal bone is found principally among brachycephalics. The inca or interparietal bone is a Wormian bone lying at the angle of the lambdoid suture, in front of the occipital bone. A præinterparietal bone is uncommon, even in the foetal skull, and is to be distinguished from a Wormian bone, being quadrilateral and occupying the situation of the anterior fontanelle.

Articulating Process of Occipital Bone.—At the same meeting F. G. Parsons²⁷⁷ showed an occipital bone with a process faceted to articulate with the odontoid process, upon discussing which Bland Sutton remarked that Mr. Arbutinot Lane had brought forward evidence to show that cases such as this, and those of ankylosis in the same direction, were the result of pressure from weights carried on the head. He had himself found similar ankylosis in the bodies of oxen near Paris, where they are harnessed by the head.

The Sternum as an Index of Sex, Height, and Age.—Thomas Dwight²⁷⁷ refers to his former paper,²⁷⁷ in which he gave the measurements of the sterna of thirty men and twenty-six women, and discussed the correctness of Hyrtl's statement that it is hardly possible to err in determining the sex of this bone, and that "the manubrium of the female sternum exceeds half the length of the body, while the body in the male sternum is, at least, twice as long as the manubrium."

In regard to the relation of the length of the sternum to the height, he concludes that one would not be justified in attaching great weight to this guide to the height in a single case, but he considers it as trustworthy a basis of estimation as the long bones, and perhaps even better. The ossification of the sternum as an index of age he believes is of little value. As an indication of the sex, it was observed that the variations of the different parts, and consequently of the totals, is greater among men than among women, but the larger number in the male series must be kept in mind.

The Clavicle and its Articulations.—P. Poirier ¹⁶⁵ has contributed an interesting and valuable account of the anatomy of the clavicle, and of its development and ossification. His numerous dissections did not confirm the accepted older accounts of the sterno-clavicular articulation. The costo-clavicular ligament is the inferior ligament of the articulation, consisting of two planes of fibres with a serous bursa between them and in its midst. In the acromio-clavicular articulation a firm cartilage is occasionally met with, a large bursa is located between the conoid and trapezoid ligaments, and a smaller one within the conoid ligament. Ossification of both the trapezoid and the conoid ligament was occasionally observed.

Influence of Posture on the Form of the Articular Surfaces of the Tibia and Astragalus.—Arthur Thompson ²⁷⁷ contributes some additional observations to his former valuable paper. ²⁷⁷ July, 1870. These observations are given to show that the squatting posture assumed by some races accounts for the marked curvature of the external condylar articular surface of the tibia, the average of which was 2.7, and also for the articular facets upon the inferior margin of the tibia, *placed rather toward the fibular side*, and along the outer side of the upper surface of the neck of the astragalus. These are the result of mutual apposition during extreme flexion of the joint in the squatting posture. These conclusions as to the position of the facets have a direct bearing upon the pathological findings in congenital talipes equinus, and are, moreover, directly opposed to the conclusions of Shattuck and Parker. ¹⁰⁰¹ v. 22

The Tuberculum Laterale of the Astragalus.—C. E. Stokes, ¹⁶ in 72 cases examined, found two examples of os trigonum, in each case connected to the astragalus by a synovial joint, which communicated with the posterior astragalo-calcaneal, and in each case the os trigonum gave partial attachment to the posterior fasciculus of the external ligament of the ankle-joint.

Ossification of the Little Toe.—Pfitzner ⁸²⁰ has suggested that this condition is probably a new race character of unknown origin. This paper has attracted considerable attention. From his investigation he concludes that the little toe is a structure in progress of retrogression. Nor is this affected by confinement of the foot running through generations, since the same change was observed in a considerable proportion of the feet of bare-footed races; it is

met with in children of an early age, and even before birth, and is not the result of inflammatory changes. It is presumably, as pointed out in the editorial before referred to, the degeneration of a useless structure, and one which never was of much mechanical value; and we cannot share Pfitzner's pessimistic views, looking forward to a succession of retrograde changes of man to a millenial biped with two toes of but two phalanges each.

ARTICULATIONS AND LIGAMENTS.

Transverse-Humeral, Coraco-Acromial, and Coraco-Humeral Ligaments, etc.—C. Gordon Brodie²⁷⁷ has contributed an interesting note to our meagre knowledge of three ligaments, the first of which, the coraco-acromial, a ligament strongly enough marked in the human subject, has not as yet, he believes, found its way into our text-books. This ligament, moreover, is more marked in the foetal humerus, and sections of the humerus at this period disclose a tract in the fibrous tissue forming the roof of the canal, well defined, and presenting the appearance as though it had been at one time fibro-cartilage and was degenerating into fibrous tissue, which, he thinks, points strongly to the fact that metamorphosis has changed the once bony tunnel into an osseo-aponeurotic canal. His description of the coraco-acromial ligament differs somewhat from that of Morris, since he considers the coraco-acromial ligament a compound structure, the outer limb representing the bony element of the sloth; whilst it is possible that the inner limb has no morphological meaning. He considers the coraco-humeral ligament as "the divorced tendon of the pectoralis minor muscle." In addition to this, it often has a short piece running from its inner border, which makes it Y-shaped, the broad, simple leg being attached to the coracoid, while the thicker broad leg runs to the greater tuberosity, and the inner leg passing to the border of the glenoid cavity.

A New Ligament in the Hand.—Lenhossék²⁷⁸ describes what appears to be a new ligament under the name of ligamentum dorsale transversum. It is a band of fascia which crosses the extensor tendons of the hand, beginning over the base of the fifth metacarpal bone and terminating in the region of the trapezium, and corresponds to the descending limb of the V-shaped ligament on the ankle.

The Functions of the Ligamentum Teres.—J. D. Bryant,¹ demonstrated before the New York Academy of Medicine, by means of an anatomical preparation, the function of the ligamentum teres, in which it was shown that its principal use when the femur is flexed was to check adduction and outward rotation, that it was most relaxed in abduction, and that the ligament was so frail that it was almost of no use in the mechanism of the joint.

THE MUSCULAR SYSTEM.

Histology of Striped Muscle.—C. F. Marshall⁸¹⁰ contributes a continuation of his former paper (1887), in which the striation was attributed to the optical properties of an intra-cellular work. In some cases the appearance of the stripes is stated to be due to the corrugated outline of the fibre. The intra-cellular net-work is found in the cardiac muscle-fibres, but muscles which move slowly contain none. The observation of Retgius, that the transverse portion of the muscle net-work is connected with the muscle-corpuscles, is confirmed.

Structure and Contraction of Striped Muscle.—Rutherford², presented before a special meeting of the Royal Society of Edinburgh his views upon the structure and contraction of striped muscle. The investigations were more especially upon the striped muscle of the crab and lobster, because of the comparatively large size of the structural elements in these animals and the readiness with which it can be fixed and prepared in different conditions. He is entirely opposed to the opinions of Mellaud, and, more recently, of Gehuchten, regarding the structure of the sarcous matter, and maintains, as he did before the International Medical Congress in 1881, that the sarcous matter consists essentially of contractile fibres as the contractile element, with an interstitial substance between, thus confirming the opinion previously expressed by Kölliker and others, and recently supported by Rollet.

Musculous Flexor Pollicis and Changes in the Musculature of the Hand.—C. Gegenbaur,³⁸¹, as a result of comparative anatomical observations as to whether or not the musculature inserted into the ulnar sesamoid bone of the metacarpo-phalangeal articulation of the thumb may be considered as the ulnar head of the M. flexor pollicis brevis, concludes that the head present in the primitive condition is subjected to altered conditions, that it is

separated from its original attachment to another head, and, when not entirely wanting, intimately united with another muscle, the adductor.

Nerve and Muscle Relations.—Cunningham,² in opening the discussion on nerve and muscle relations before the Section of Anatomy and Physiology of the British Medical Association, stated that a proper solution of the problem could only be attained by approaching the question from two points of view: (1) by studying the early connections which exist between the muscular and nervous systems in the embryo; (2) by examining one or more groups of muscles, the homologies of which were undoubted in a large series of animals, and observing whether in every case the nerves of supply were the same.

Alterations in Calibre of Striated Muscular Fibres.—Reitaro Mayeda, Kioto, Japan,³¹⁴ from a careful study, concludes that the maxima and minima vary greatly. If from the average-calibre fibre of every muscle is obtained the average calibre of fibres for all the muscles of one kind, it is found that the thickness of muscle increases in the following order: fish, amphibia, reptile, mammals, bird; and that, as regards the differences between maximum and minimum of fibre-calibre, the order is the same as that of the average, except that the frog comes before the fish. According to variations in width, the groups are arrayed: (1) fish and batrachia; (2) reptiles; (3) mammals; (4) birds.

Muscle-Buds.—Otto v. Franque,¹⁸ as a result of some recent comparative studies, reaches the following results in man: (1) the transformation of the tissue of the muscle-buds into ordinary muscle-tissue also occurs in old age; (2) the muscle-buds of man are also demonstrable in the voluntary muscles belonging to the digestive tract.

Muscles of the Ear.—G. Killian³¹⁶ calls attention to the comparative anatomy and development of the muscles of the ear. He considers the stapedius, which he finds is derived from the posterior belly of the digastric muscle in reptiles, amphibia, and mammals, to be the oldest, the tensor tympani appearing later. The latter, according to Killian, springs from the internal pterygoid muscle, and its nerve-supply can be traced to the nerve of the internal pterygoid muscle, passing through the optic ganglion in its course.

Muscles of the Forearm.—A. L. Benedict¹⁷⁰ contributes a table and generalizations concerning the muscles of the forearm, the result of original anatomical studies which will serve a useful purpose in keeping this complicated region clear and accessible in the memory.

The Insertions of the Pectoralis Major Muscle.—A new study of the insertions of the pectoralis major, made by Reuleux,²⁹³ confirms in almost all details the well-known description of Theile. He calls attention to the curious fact that the two muscles (sternal and costal divisions of the pectoralis major) which form the anterior border of the base of the axilla bear the same relation to one another as is observed between the two muscles (teres major and latissimus dorsi) which form the posterior border of the same space. This analogy is very striking, as viewed from the results of this author's very careful investigations.

THE HEART AND VASCULAR SYSTEM.

The Structure of the Medulla of Bone and the Genesis of the Blood in Birds.—Denys⁵⁴ found, as the result of his investigations in birds, in the marrow of bone between the blood-vessels and the supporting cells, two kinds of cells,—the erythroblasts, which produce the red blood-corpuscles, and the leucoblasts, which produce eosinophile leucocytes. If the nutrition be defective the multiplication of both these cells is retarded, and finally ceases. Finally, only old erythroblasts are found in the capillaries. The leucoblasts also disappear not only by gaining entrance into the circulation, but by degenerating *in loco*, being replaced by mucin substance. The marrow is then converted into a mucoid tissue, with stellate and round (fat) cells.

Formation of the Portal Vein.—W. Henry Thompson¹⁶ presented before the Ireland Academy of Medicine the results of his investigations upon the formation of the portal vein. Out of 53 cases the *inferior mesenteric* ended in the splenic in 30, in the superior mesenteric in 20, and in the angle between both in 3. Out of 44 cases the *coronary* ended in the portal in 26 cases, in the splenic in 18. Four chief "types" were found in 44 subjects: (1) found in 16, the inferior mesenteric joined splenic, coronary entered portal; (2) found in 11, the inferior mesenteric joined the superior, coronary entered splenic; (3) found in 7, both inferior

mesenteric and coronary entered splenic; and (4) found in 7, neither inferior mesenteric nor coronary joined splenic; former joined superior mesenteric, latter joined portal. The first of these is considered normal. Out of 46 cases the portal vein was formed at a level of second lumbar vertebra in 32.

Arrangement of the Renal Arteries.—A. C. Sullivan and O. L. Robinson,¹⁶ reported before the Ireland Academy of Medicine the result of their examination of 43 subjects. In these they found the number of arteries varied from one to four. One or more arteries always entered the sinus. In 18 cases an accessory artery entered at the upper or lower border; accessory arteries arose from the aorta and renals, except in one case,—from the common iliac. In 46 cases all branches passed between vein and ureter, in 6 they inclosed vein and ureter, in 11 inclosed vein only, in 6 ureter, and in other 6 all the arteries passed in front of the vein. In these investigations, as pointed out by Birmingham, the termination of the inferior mesenteric vein differed from the results of Treves, who found that the vein terminated in the splenic in only 18 per cent. of his 100 cases.

Veins of the Foot and Methods of Venous Injection.—Dwight,⁹⁹, refers to a new and valuable method by Lejars⁷⁰⁰ for injecting the veins of the foot, which appears to be a great improvement upon that of Bourceret. The limb is warmed and a mixture of wax and tallow, stained by some soluble coloring matter, is injected through the artery till the veins are distended. This is then followed by another injection through the artery of a mass with a granular coloring matter, which does not pass the capillaries.

The Blood-Vessels of the Spinal Cord.—Kayde¹¹²⁹ has published a description, with plates, of the blood-vessels of the spinal cord. The blood-vessels of the cord constitute a closed system, connected with the general circulation by means of small vessels accompanying the spinal nerves. Arteries enter and veins pass out of the cord with the nerve-roots. To these the names root-arteries and root-veins are given. Their number varies. Some are anterior, some posterior. Of the former there are from 5 to 10, of the latter from 16 to 17. The anterior arteries divide, close to the longitudinal fissures, into ascending and descending branches. The anastomosis of these branches gives rise to tractus arteriosus

anterior medullæ spinalis. The posterior arteries divide on the lateral aspect of the cord into ascending and descending branches, the anastomoses of which give rise to tractus arteriosi postero-laterales medullæ spinalis.

The deep distribution and termination of the terminal arteries is beautifully described, and the sum of the transverse section of the veins which enter the substance of the cord is given as not two and a half times that of the arteries, but a little less. A direct anastomosis between arterial and venous twigs by vessels two or three times the diameter of the ordinary capillaries is also described.

Blood - Vessels of the Nerves.—Quénu and Lejars³ have studied the blood-vessels of the nerves,—*vaso nervorum*,—and give an interesting and valuable description of the blood-supply, in particular of the cervical portions of the pneumogastric, great sympathetic, and the recurrent nerves. The recurrents are wholly nourished by branches from the inferior thyroid artery. From this source also the pneumogastric and sympathetic receive all the blood-supply for their lower parts; above, and especially in the region of the superior cervical ganglion and of the gangliform plexus of the pneumogastric, they receive branches from the superior thyroid. These nutritive arteries approach the nerve-trunks obliquely, or, after describing a recurrent course, branching and anastomosing upon the surface before entering the sheaths. The veins are more abundant than the arteries, and often do not accompany them, but form upon the ganglia very beautiful plexuses, many finally emptying into either the net-work of the *vaso vasorum* of the primitive and internal carotids or the thyroid vein, or most especially into a plexus of muscular veins lying in the lateral wall of the pharynx; while others join the veins which interlace upon the bodies of the vertebræ and in the prevertebral muscles. It will be noticed how generally these nerve-veins reach the muscular veins,—a disposition which has been also remarked in veins of the nerves of the extremities,—and the authors regard this arrangement as most favorable for the expulsion of the venous blood from the nerve-trunks.

THE ALIMENTARY APPARATUS.

The Pharyngeal Pouch.—By means of frozen sections of the entire pharynx, Pölchen²⁰ has been able to demonstrate that there does exist in the median line of the retropharynx a depression or

recess between the two recti capitis antici majores,—the recessus medius, or pharyngeal pouch of Tornwaldt. This depression is lined by the mucous membrane of the pharynx, in which it forms a veritable pocket. When the adenoid tissue is very well developed the depression may be filled up and effaced. The author has also shown that this recess remains immobile during deglutition, serving as a reservoir for mucus, which constantly discharges from it, and that it is predisposed to secretory disturbances, such as hypersecretion, retention, and suppuration.

The Development of the Tonsils.—Stöhr,²¹⁴ in a study of the tonsils and their development, insists upon their adenoid character and antagonizes the view of Ritterer, who describes them as angio-thelial structures. Stöhr believes that the migration of leucocytes, so abundantly observed about the tonsils and other adenoid structures, accomplishes the removal of the products of disintegration, in the performance of which the leucocytes themselves perish.

Structure of the Hepatic Lobules.—From examinations of the liver of the cat, of the calf, of the dog, and of man, Disse²⁹ arrived at the conclusion that the space surrounding the capillaries of the hepatic lobules may be injected through the lymphatics, and possesses an independent wall, composed of a structureless ground-substance and a net-work of fibres of unequal thickness, lined by flat, stellate cells, surrounding the capillary at a little distance like a tube, which is connected with the intercellular cement-substance, and lies close to the liver-cells. From this sheath fibres pass to the trabeculæ of the liver-cells and join the capillary sheaths together. In this way the sheaths of the capillaries form the basis for the stroma of the hepatic lobules.

The Development of the Spleen.—Toldt²² maintains that the spleen is not developed from the same foetal envelope as the pancreas, but from the mesogastrium.

Valvulae Conniventes in Man.—Brooks¹⁶ states that although all English text-books and most Continental writers, except Henle, describe the valvulae conniventes in man as crescentic folds of mucous membrane of the intestines, which extend, as a rule, no more than two-thirds round the intestine, he found, at least in the upper part of the jejunum, to which his observations were confined so far, that they frequently form complete rings and sometimes spirals, extending more than once around the intestine.

The Mesentery and Omentum.—Toldt⁸ believes that abnormalities of these structures are results of aberration of development, from the persistence of structures which normally disappear or the atrophy of others which normally persist.

THE GENITO-URINARY APPARATUS.

Lymphatics of the Penis.—Horovitz and Zeissl⁴⁵ reported the results of their investigations upon the lymphatics of the penis. The *superficial* vessels were found to follow the course usually described, terminating in the lymphatics of the groin; but the assertion that all the superficial vessels converge to one trunk at the pubis was not confirmed, as they only found one case that could sustain this opinion in forty-eight separate injections of Berlin blue on the cadaver. The *deep* lymphatics were found to vary somewhat from the classical description along the course of the internal pubic vessels to join the internal iliac glands. They were found to lie with the *vena dorsalis* under the tunica albuginea, and end in one case under the suspensory ligament; another time it gave a branch to the glands of the groin; another to the glands under Poupart's ligament; but most of the lymphatics terminated in the lymphatics of the pelvis. They describe a lymphatic vessel not hitherto recorded, coming from the *vas deferens*, which they prove by injections into the median line of the scrotum. These accompany the *vas deferens* along the posterior part of the bladder, and finally wind outward to the lymphatics lying on the inner wall of the pelvis, where they end in the internal iliac vein. No branch was traced from the *vesiculæ seminales*.

The Mucous Lining of the Uterus.—Boldt²⁷ presented to the Tenth International Congress the result of his microscopical examination of the glands of the cervix and body of the uterus. He found that they were surrounded by a net-work of smooth, muscular fibres, which are connected with the muscles of the uterine wall. The physiological function of these glands is the production of mucus.

Anatomy of the Human Ovary.—W. Nagel^{95, 27} considers an increase in the visible follicles of the human ovary not as a pathological event, but as a distinctly physical condition. He contends that no diseased condition of the ovary occurs which may rightly be termed "miliary cystic follicular degeneration," and states that

when an ovary is found essentially enlarged, with numerous tensely-filled cysts from the size of a lentil to that of a bean, it will be more nearly correct to consider such as normal Graafian follicles in various phases of development. The formation of genuine cysts is accompanied by such striking alterations in the entire ovary, and the cysts themselves present such characteristic features, that they can also be readily distinguished from Graafian follicles. The most common error is that of mistaking a beginning cystoma during two stages of its development, (1) just at the beginning, and (2) at a later stage; but a microscopical examination will at once decide the difference.

The Significance of Ovarian Follicles.—Nagel⁹⁵ denies that an increase of the visible follicles of a human ovary is pathological. Such a condition may be found at any time in the child-bearing period, and even in the newborn, and careful examination would disclose that the follicles contained normal ovules. Degeneration of ovisacs may occur in slight degree in healthy ovaries, but occurs only extensively when the ovary has long been the seat of disease. Investigation has shown that there is really no such disease as small cystic follicular degeneration of the ovary. An enlarged ovary, presenting numerous tensely-filled small cysts, as a rule, represents a normal condition.

Structure of the Oviducts.—As a result of examinations of 47 oviducts, Cohen¹⁵⁰ has arrived at the following conclusions: (1) folds in the mucous membrane of the oviduct are less numerous at the uterine than at the fimbriated extremity; (2) the folds of mucous membrane of the oviducts increase with advancing years; (3) the ciliated epithelium of the oviducts disappears with increasing years, and is replaced by cylindrical and pavement epithelium; (4) the altered epithelial cells present peculiar shapes; (5) the oviducts contain no glands.

Lymphatics of the Female Genital Organs.—Poirier,¹⁰⁰ in addition to the inferior and superior groups of the vaginal lymphatics, describes a middle group terminating in two large trunks on each side, which accompany the vaginal artery and empty into two glands upon the sides of the rectum at the origin of the vaginal, umbilical, and internal pudic arteries. The lymphatics of the cervix uteri merge into two or three large trunks on each side, which, accompanying the uterine vessels, reach the two or three

glands at the bifurcation of the primitive iliacs. The existence of a distinct subpubic gland, as described by Lucas-Championnière, is described. The lymphatics of the body of the uterus reach the lumbar glands by two vessels on each side, which in their course communicate with the five or six terminal trunks coming from the ovaries and reaching the same glands. A single trunk accompanies the round ligament and reaches the inguinal ganglia.

The Mucous Membrane of the Bladder.—Dogiel^{18, 29} has made a study of the epithelium of the bladder in white and domestic mice, white rats, hares, dogs, cats, and man, and describes in detail the constituents of the four layers of which the epithelial lining of the bladder is made up.

The Aponeuroses of the Perineum and Pelvis.—An elaborate study of the aponeuroses of the perineum and pelvis by Rogie²²⁰ adds nothing new to the classic descriptions of the perineum, but prompts the following considerations of the pelvic aponeuroses: The intra-pelvic parts of the obturator internus and the pyriformis, considered together, form a sort of cylinder (interrupted before and behind), whose superior border rests near the superior straight of the pelvis and the inferior at the arcus tendineus and the ischio-coccygeal ligament (the sacro-sciatic ligaments). There is, therefore, a vast cylindro-conical wall, presenting an anterior slope at the level of the pubes and a posterior slope at the level of the sacro-coccygeal region. This wall is covered upon all the extent of its internal face by an aponeurotic or muscular lining, which, after Denouvillers, he proposes to name the anatomical pelvic aponeurosis. By analogy the cavity limited by this aponeurosis will be designated as the anatomical pelvic cavity. A fibrous expansion springs from the aponeurosis, to be lost upon the lateral faces of the bladder and rectum, dividing the cavity into two parts. One, the inferior, can be called the prostato-ampullary space, because it contains the prostate anteriorly and the rectal ampulla posteriorly, separated by a partition called by Denouvillers the prostato-peritoneal aponeurosis. The second, superior, is no other than the surgical pelvic cavity, limited by the fibrous layer which is uncovered by removing the peritoneum, and which the author calls the surgical pelvic aponeurosis. The surgical pelvic cavity comprehends the pelvi-rectal space of Richet, with its cellular tissue, and the most inferior parts of the peritoneum. In woman

the aponeuroses of the perineum and pelvis present a close analogy to the corresponding formation in man.

The Relation of the Peritoneum to the Bladder.—Diakonoff, of Moscow, corresponding editor, writes that N. A. Batoujeff⁵⁸⁶ has made a new series of experiments upon the cadaver for the purpose of studying the relations of the peritoneum to the anterior abdominal wall in male adults under different degrees of distension of the bladder and the rectum. His experiments show that the advancement of the summit of the bladder above the symphysis pubis does not in many instances elevate the anterior fold of peritoneum, and that a moderate distension of the bladder does not suffice to raise this fold to any considerable height. When the bladder contains from 200 to 300 grammes ($6\frac{1}{2}$ to $9\frac{1}{2}$ ounces) of liquid, the peritoneal fold rarely reaches the same height above the symphysis; and when the bladder is easily irritable, and has a smaller capacity, there is great chance of encountering the peritoneum at the level of the upper border of the symphysis.

Relations of the Pelvic Viscera in the Infant.—J. W. Ballentyne⁸⁶ contributes an exceedingly valuable paper upon the relations of the pelvic viscera in the infant, founded upon the thesis on "Certain Anatomical and Pathological Conditions in the Fœtus and Infant at Birth," for which the Gunning-Simpson prize and a gold medal were awarded in 1889. It has been supplemented by frozen sections of three additional newborn infants—two males and one female. In it several observations of great practical value are recorded. The greater obliquity of the pelvis in the infant and also the absence of obliquity in the plane of the pelvic outlet are demonstrated.

The diameters of the pelvis differ somewhat from those of Balandin and Litzmann. The bladder is shown to be practically entirely an abdominal organ at birth. When empty its walls were found in apposition, and when distended its broad end was directed downward, and not the larger and superior, as formerly described. Between the anterior vesical wall and the anterior abdominal wall there is no intervening pouch of peritoneum, and the anterior surface of the bladder, triangular in shape, is therefore entirely uncovered by peritoneum,—a fact of great importance to the surgeon who may be contemplating operative interference for stone. The bladder itself is relatively small, and this fact is at least one of the

causes of frequent micturition in infants and young children. The relatively larger and more vertical position of the rectum was confirmed, and its effect in favoring the production of prolapsus recti commented upon. The vertical position and the position of anti-version of the uterus are considered as representing the normal lie of this organ in the newborn infant, and the gaping condition of the os uteri was a notable character of all the uteri examined. The position of the ovaries could not be described with any degree of definiteness.

THE NERVOUS SYSTEM.

Structure of the Gray Matter of the Brain.—Schütz,⁷⁵ divides the gray matter surrounding the cerebral cavities into three layers: (1) the subependymal medullary layer; (2) the reticulated gray layer; (3) the nuclear gray layer. The subependymal medullary layer consists of a series of delicate longitudinal fibres, immediately beneath the ependyma, extending from the upper cervical cord to the middle of the thalamus. It has connections by bands of fibres with all the surrounding large ganglia, also with the lenticular loop, the optic tract, and the posterior columns. The reticulated gray layer is the best developed in the region of the trigeminus nucleus and of the trochlear nucleus. The nuclear gray layer is constituted by the nuclei of the cranial nerves. The subependymal medullary layer is developed late in man, toward the close of foetal life. The net-work of the cranial nerve-nuclei is not yet completed in the newborn. A net-work may be found in the region of the nuclei of the nerves of the ocular muscle as early as the seventh month. The reticulum of the central gray matter is said to disappear in paralytics as a systemic condition.

Tangential Nerve Net-work in the Cortex Cerebri.—Galdberg⁴¹, has found, as the result of his investigations, the nerve-fibre net-work in the tangential marginal zone to vary in number and distribution of the fibres in the different parts of the cortex; varicose enlargements were discovered upon these fibres, but he was unable to determine the nature of the enlargement.

Weight of the Brain.—Obersteiner,⁶⁸ corresponding editor, Vienna, reports the weight of a brain the heaviest yet known, 2028 grammes (65½ ounces), from a man of 58, of moderate mental and bodily development.

Convolutions and Sulci of the Frontal Lobe.—Eberstaller¹¹²⁸

(reported by Obersteiner, corresponding editor, Vienna) gives a minute description of the convolutions and sulci of the frontal lobe. The fissure of Sylvius is rather longer in the female than in the male. A preponderance of the frontal lobe in the male, often stated to exist, was not observed. The existence of four convolutions, by some considered an evidence of central degeneration, may be present in any brain, and is usually a result of division of the middle frontal convolution.

Fissures and Convolutions of the Cerebral Hemispheres.—The address on cerebral anatomy² by D. J. Cunningham, before the British Medical Association, contained the following facts: 1. Toward the end of the second month of development the thin wall of the human cerebral hemisphere became deeply infolded in particular localities. 2. In all probability these infoldings were peculiar to the primate brain. 3. They occurred prior to the mapping out of an occipital lobe, and during the time that the cerebral hemisphere presented an outline similar to that of a quadruple hemisphere. 4. They were obliterated (with the exception of two, or it might be three, which were retained as permanent fissures) when the occipital lobe became evident, and where the characteristic form of the primate cerebrum was attained. 5. They were, in all probability, the result of a want of harmony between the growth of the cerebrum and that of the cranium.

At the Tenth International Medical Congress², the growth of the primate brain was again discussed by the same author, and the antagonism between the growth of the cranium and the cerebral growth, and the transitory infolding of the thin cerebral wall, again referred to.

Parieto-Occipital and Calcarine Fissures.—Cunningham¹⁶ made a communication to the Ireland Academy of Medicine upon the parieto-occipital and calcarine fissures of the brain, their development and relation to the calcar avis. He referred to the conflicting views held regarding the development of these fissures, the difficulty in connection with their study being due to the fact that their origin is synchronous with that of the transitory fissures of the brain, and that they lie in series with them. He proposed the name "precursors" for those early fissures corresponding in position to the parieto-occipital and calcarine fissures, and traced the connection between the precursors and the permanent fissures,

showing how the history of either of the two fissures might be made out not only in the brain of the seven months' foetus, but even, in most cases, in the adult brain. The phylogenetic evidence adduced in reviewing the question he showed to be at variance with the ontogenetic evolution of the fissures under consideration. In another paper²⁷⁷ he considers the "Complete Fissures of the Human Cerebrum and Their Significance in Connection with the Growth of the Hemispheres and the Appearance of the Occipital Lobe," and, although the material is necessarily limited, adds much valuable information to the general knowledge upon this important subject.

Intra-Parietal Sulcus of the Brain.—Cunningham²⁷⁷ divides the intra-parietal fissure into an anterior division, superior and inferior, usually parallel with the central fissure; a horizontal division, passing off from the first; and an occipital division, in the occipital lobe. These divisions may be separated from one another. The horizontal may be connected only with the superior or with the inferior, or the latter may be united and the horizontal divided. Most frequently, all are united.

Structure of the Cerebellum.—Ramon y Cajal⁸⁰³ demonstrated that from the granular layer of the cerebellum of the guinea-pig axis-cylinders come off, passing toward the molecular layer, dividing in this, and giving origin to two bundles of longitudinal fibres, which run parallel to the surface. Sections through the cerebellum of the raven displayed small, stellate cells in the molecular layer, the axis-cylinders of which did not pass into the white substance, but which diverged at the level of the cells of Purkinje, so that the cells occupied the centre of and was surrounded by the fibres. This termination of nerve-fibres and the arrangement of cells are new and important.

Termination of Spinal Fibres in the Cerebellum.—Borghe-
rini⁸⁴ finds that the fibres from the spinal cord which enter the cerebellum are arranged in three groups,—a plexus in the stratum granulosum, one in the zone of Purkinje, and a third in the stratum moleculare. The first is a delicate plexus and seems not to be connected with the others and not with the radiations of the white substance. The fibres of the other two run parallel to the surface and are intimately connected. The plexus of the zone of Purkinje is connected with the radiations of the white substance. The

cortex of the middle lobe and of the hemispheres has practically the same structure.

Test of Wilson's Cyrtometer.—H. J. Mulford²⁴² in some recent experiments has tested the cyrtometer in locating the position of the fissure of Rolando, finding it absolutely correct in three out of eight, in two correct in all but length, and in the other three from $\frac{1}{2}$ to $\frac{1}{4}$ inch behind the fissure. The cyrtometer employed was made of elastic metal ribbon like a clock-spring.

Origin of the Optic Nerve.—Irreproachable evidence has not yet been adduced demonstrating that the optic nerve, besides its fibres of origin from the corpora quadrigemina, the corpus geniculatum, and the thalamus, receives fibres from portions of the brain posteriorly. Perlia⁵⁴ has been able to follow the atrophy, after extirpation of an eye in the hen, in a considerable bundle of fibres of the optic nerve, through the whole mid-brain into the after-brain, in which it enters a nucleus to the side of the trochlear nucleus.

No Increase in the Oculo-Motor Nerve-Fibres.—Schiller,⁹¹⁶ studied the oculo-motor nerve of a cat, and arrived at results from which it must be concluded that the number of fibres does not increase. Forel states⁹¹⁶ that this was to be expected. As every fibre corresponds to a cell, it is probable that the ganglion-cells last as long as life. Investigation shows that a ganglion-cell once destroyed is never replaced,—an important point in explaining the phenomena of memory.

Origin of the Ninth, Tenth, and Eleventh Cranial Nerves.—P. D. Koch⁸⁷⁸ states that sections in series show that the root-fibres of the spinal accessory nerve come from the lateral group of cells of the anterior horn of the cervical cord, and from the direct continuation of the same structures in the medulla, which represent the most external part of the so-called accessory hypoglossal nucleus. This would explain the simultaneous palsy of the posterior crico-arytenoid muscles and of the lower portion of the trapezius, and of the simultaneous palsy and atrophy of one side of the tongue, the vault of the palate, and the vocal band. Koch denies the existence of the anterior nucleus of the vagus. Fibres from the solitary bundle, from the so-called posterior nucleus, and from the raphe reach the vagus root. The glosso-pharyngeal has the same three sources of origin as the vagus.

Nerve-Supply of the Sense of Taste.—John Ferguson⁹

presents a case of pressure destruction of the Vidian nerve, which seems to prove very definitely that the loss of taste in this instance was due to the destruction of this nerve, but the evidence that the glosso-pharyngeal nerve is not concerned in supplying the sense of taste is not so well established. In fact, as pointed out by Dana,⁹ the contrary has been clearly proven in his former contribution²⁴² on "Paralysis of the Trigeminus and its Relations to the Sense of Taste." The case is, however, a valuable contribution to the subject.

THE SPINAL CORD.

Development of the Neuroblasts in Embryonal Marrow.—His,²²⁰ describes the development of the neuroblasts from the germinating cells of embryonal marrow by division and cell differentiation. Of the neuroblasts in the spinal cord some send their axis-cylinders into the anterior nerve-roots, others into the anterior commissure and the longitudinal columns of the medulla. As a result, the *dictum* can be laid down that all central nerve-cells develop only in one direction. The cells of the spinal ganglia grow in two opposite directions. The nucleated bodies of these cells become farther and farther removed from the common axial area of both fibres, which thus obtain the characters of independent structures, the cells the characters of a lateral attachment of the sensory fibres.

Inhibitory Secretory Fibres in the Cervical Sympathetic.—Arloing²¹¹ reports the results of experiments upon the ox, which seem to show the existence of inhibito-secretory fibres in the cervical sympathetic. Thirty or forty days after section of the nerve of one side, and when excitation of the distal end could no longer produce secretion of the glands of the muzzle, 10 to 15 centigrammes (1½ to 2½ grains) of pilocarpine, given hypodermatically, established secretion, at first upon the sound and then upon the mutilated side, with the difference that from the latter the drops were larger and were more quickly exuded. The only explanation plausible to the author is that these glands had been deprived of the influence of inhibitory fibres. The same experiment was attended with a persistent exaggeration of secretion from the lachrymal and Meibomian glands of the same side. He therefore concludes that the sympathetic embraces two sorts of secretory fibres, just as it has two opposing sets of vasomotor filaments.

Spiral Fibres and Pericellular Net-works on the Ganglion-Cells of the Sympathetic.—Julius Arnold³¹⁶, antagonizes the view of Ranzier, recently maintained by Feist, a pupil of Schwalbe, that the superficial net-work of the cells of the sympathetic of the frog, first described by Arnold and considered as the termination of the spiral fibres, is an artefact, and presents the opinion of Arnstein and Retzuis upon the question of the identity of the superficial net-work of Arnold, and that of Ehrlich questioned by Feist.

Minute Structure of the Spinal Cord.—Golgi, of Pavia,^{316, 39} calls attention to his former observations upon the morphological difference between motor and sensory nerve-cells and the arrangement of their processes, which have not received the general attention they deserve. According to him, all the nerve-cells of the cord may, in a certain sense, be called unipolar, as but a single one of their processes ever joins nerve-fibres. The course of this process is entirely different in two classes of cells, and serves as the real distinction between them. The first takes part in the formation of a general nervous net-work; the second, the so-called protoplasma processes, never directly or indirectly serve for the origin of nerve-fibres. There is a nervous net-work extending throughout the gray matter of the cord, formed (a) by the breaking up of the nerve-processes of the cells of the former class; (b) by fibres of the posterior roots which break up in the same way; (c) by offshoots from the nerve-processes of cells of the second class; (d) by fibrils given off by the axis-cylinders of the different tracts of the white substance. These views, if admitted, will explain some of the discrepancies of observation as to the course of motor and sensory impulses.

On the Origin and Branching of the Nerve-Fibres of the Spinal Cord.—Ramon y Cayal,^{316, 2} not satisfied with the method of Golgi,—prolonged immersion of a hardened cord in a weak solution of nitrate of silver,—has improved upon his method, and has investigated the course of the nerve-fibres in the cord during its development, and to him belongs the credit of having discovered the peculiar relations of the fibres of the posterior roots of a spinal nerve. The fowl embryos used were from the sixth to the fourteenth day of incubation. According to this author, the collateral fibres are connecting fibres, which are sent by the white fibres to the gray matter to bring comparatively distant

ganglionic cells into relation with other ganglionic cells. The fibres of the posterior root pass obliquely into the cord from the intervertebral ganglia into the posterior column of the cord. In Goll's column each fibre divides in a Y-shaped manner into two thick terminal fibres, an ascending and a descending fibre, all three branches of which give off collateral fibres, which resemble the similar fibres given off by the fibres of the anterior column.

Ranvier's Constructions in the Spinal Cord of Vertebrates.—W. T. Porter⁸¹⁰ confirms the existence of Ranvier's constructions in the spinal cord of vertebrates, their presence being best demonstrated on silver and osmium preparations after tearing. Longitudinal sections of the spinal cord of the ox from near the median fissure, and especially the outer fibres of these sections, also give satisfactory results.

Course of Sensory Nerve-Fibres in the Spinal Cord.—Edinger^{316, 90} has given the results of his extended observations on this subject. He concludes that a portion of the posterior root of a spinal nerve passes forward in the gray matter and decussates with those of the opposite side, partly in front, partly behind, the central canal; they then pass to the antero-lateral tract of the opposite side, and are continued upward in this tract to the medulla. These observations give anatomical support to clinical experience and physiological experiment, which require decussation of a portion of the sensory path immediately after entering the cord.

Comparative Study of the Spinal Cord.—Waldeyer¹¹³² has made a careful comparative study of the spinal cord of a 2- or 3-year-old gorilla, of a 2-year-old child, of adults, and of apes. The cord of the gorilla most nearly resembles that of man. It is, however, decidedly smaller than that of a 2-year-old child. Despite the mammoth arms of the animal, its cervical enlargement is even smaller than that of the child. The gray matter in the dorsal cord of man has a different development from that of the ape. No fibres pass through the anterior commissure. The fibres which take part in its formation are of anterior and lateral origin. No fibres arise from the posterior horns. The posterior commissure, without doubt, receives a portion of its elements directly from the sensory roots. The component parts of the middle group of fibres pass through the substance of Rolando as several large bundles and pursue a longitudinal

course as soon as they have passed the anterior limit of the gelatinous substance. At times this turn takes place in the marginal zone. Some of the fibres pass round the substance of Rolando instead of passing through it. Positive relations to the posterior commissure have been demonstrated. The questions which arise concerning the lateral group of bundles are most difficult of solution. The most or all of these fibres ultimately pass into the net-work of Lissauer, which contains cells of the posterior horn, from which probably a portion of the fibres of the posterior commissure originates.

Course of the Posterior Roots.—V. Lenhossik,⁵⁵⁹ has made a careful study of the course of the posterior roots in the cat, the dog, the guinea-pig, the mouse, and in man, which he found to divide, soon after entering the cord, into many medullary bundles,—from their direction are designated median, middle, and lateral groups. The median portion enters, in part, directly into the posterior columns, in part (straight fibres) passing first through the gelatinous substance of Rolando to find its way into the posterior columns. Another portion of the medial group of fibres passes in the lower half of the dorsal and lumbar cord in the columns of Clarke. As regards the antero-lateral ascending tract, Auerbach²⁰ says that opinions are divided as to its central continuation. Edinger believes that it passes by the interolivary layer and with the fillet to the corpora quadrigemina; Fuchsig, that they are continued as the posterior longitudinal fibres; and Bechterew, that they pass into the formatio reticularis, more particularly at its inner part. By experiments upon cats from 3 to 5 months old, Auerbach was able to produce ascending degeneration in the ground-fibres of the anterior and lateral columns. Some of the degenerated fibres originated from the anterior commissure. The degeneration, however, gradually diminishes from below upward, and the impression is produced that the degenerated fibres pass off into adjacent gray matter. At the level of the decussation of the pyramidal tracts but a small area of degeneration remains. The inference is that the antero-lateral columns contain fibres which connect various segments of the spinal cord with one another and with the first part of the medulla oblongata.

The Effect of Hanging Postures on the Vertebral Column.—James Cagney²⁷⁷ has given the result of his experiments to ascer-

tain the effect of suspension on the spinal cord. He endeavors to show that a shortening and a relaxation takes place in all the three curves when the body hangs freely, and that this occurs by different mechanism for each curve, and argues that the curves lengthen out in suspension, i.e., become arcs of larger circles, and, as the subtending cords remain unchanged, are consequently shortened, for if the cords are equal it is evident that the arc of the larger circle approaches more nearly to a straight line. The question is of interest and of great practical importance.

Termination of the Dural Sac in the Human Spinal Canal.—Wagner²⁰⁰,²⁰¹,²⁰² endeavors, by the method of injection, to ascertain the extent of the dural sac. In twenty children thus examined 10 per cent. terminated at the middle of the second sacral vertebra, 10 per cent. at the end of the second vertebra, 65 per cent. at the beginning of the third sacral, 10 per cent. at the middle of the third sacral vertebra, and 5 per cent. at the end of the third sacral vertebra. In the first year, then, the upper part of the third sacral vertebra appears to be the normal place of ending. These observations were also made upon five adults, from which it appears that the sac descends somewhat lower in children than in adults. The surgical practical point is evident.

Innervation of the Thenar Eminence.—Lejars⁷ calls attention to the facts that in the reports of several instances of section of the median nerve at the wrist sensation remained intact over the thenar eminence, and that the abduction of the thumb was unaffected. These facts, unexplainable upon the ground of the generally described innervation of the thenar region by the median and musculo-cutaneous nerves, he believes to be readily accounted for by a distribution of filaments from the radial nerve for the innervation of this region. This he has demonstrated by careful dissections.

ORGANS OF SPECIAL SENSE.

Turbinate Bodies of the Nasal Mucous Membrane.—J. Herzfeld²⁰³,²⁰⁴ found that the turbinate bodies, as well as erectile structures in other parts of the body, contain an abundance of organic muscular tissue. No true erectile structure, however, was found on the septum or floor of the nose, but an extensive venous plexus and many glands.

Recuperation of the Retina.—Fick and Gürber¹⁸,²⁰⁴ deny

that the sensibility of the retina is greater in the morning than at night, with the corollary that the sensibility gradually diminishes during the day. It is true, the retinal sensibility is greatest immediately after awaking, but about three-fourths of an hour later the degree may remain unvaried almost indefinitely. Utilization of different portions of the retinal field for vision does not afford an opportunity for rest. Movements of the eyes and of the lids and accommodative action, however, do afford relief.

Visual Acuity of the Retina.—Angelucci¹⁸ has made some investigations as to the visual acuity of the retina and of the brain. He discusses the question under three heads: (1) the vital manifestations of the neuro-epithelial retinal layer and a new doctrine of vision; (2) mechanism of the construction and function of the leading paths of light perception; (3) the light-perceptive qualities of the cerebral cortex in higher vertebrates and in man.

Intervaginal Space of the Optic Nerve.—Pfister²⁰⁴ found generous communication between the subdural space and the intervaginal space of the intra-orbital portion of the optic nerve. In some sections a bridge-like connection existed between dura and pia, most frequently below and externally, in which situation the trabeculae of connective tissue were numerous and thick.

Distribution of the Anterior Ciliary Nerves.—Boucheron²¹⁶ finds that the anterior ciliary nerves do not pass directly to the cornea, but first from a plexus in the episcleral tissue and then in the cornea, before reaching their epithelial terminations. The union in the plexus with the deep ciliary nerves is only partial. The centre of the cornea is supplied exclusively by fibres of the long ciliary nerve, the periphery by superficial nerves, the intermediate zone by branches of both.

Corneal Nerves.—Dogiel⁸¹⁶ has also made a careful study of the corneal nerves, and presents some new observations upon their course and termination.

The Lachrymal Caruncle.—Peters²⁹ describes Harder's gland, or the lachrymal caruncle, as an acinous structure, the acini of which are of varying size, with wide lumina and cubical epithelial cells. Steida,²⁹ however, does not believe that the glands found in the lachrymal caruncle, besides the sebaceous glands, are sweat-glands, but accessory tear-glands. He considers the goblet-cells found here as evidences of hyaline degeneration.

Formation of the Pigment of the Skin.—Philipson⁵⁴ makes the "mast" cells in the cutis the seat of the formation of the pigment of the skin. The mast cells are supposed to receive a colorless, granular material from the blood, which is transferred from cell to cell, to become transformed into pigment.

REGIONAL ANATOMY.

Relation of Internal Maxillary Artery to the External Pterygoid Muscle.—J. J. Long¹⁸ reported before the Ireland Academy of Medicine the result of his investigations upon 48 arteries examined. The artery ran superficial to the muscle in 50 per cent. of the cases, and then entered between its two heads. In 42 cases the artery lay deeper than the external pterygoid, in 19 of these cases the inferior dental, and in 7 the lingual nerve passed down superficial to the artery.

New Method of Exhibiting the Topographical Anatomy of the Brain.—Frazer¹⁸ exhibited before the Royal Academy of Medicine in Ireland an extensive series of heads illustrating the topography of the brain in the adult male and female and also in the child. Including different levels from the surface with the measured tapes to the corpus callosum, they exhibited well the wonderful correspondence of the topography in the adult and child.

On the Positions of the Organs in Different Movements of the Neck.—Delitzin⁶⁰⁰ concludes that the movements of the neck exercise without doubt an important influence upon the organs of all the systems contained in the neck. In all movements of the head the shifting of the organs in the upper part of the neck is much greater than in the lower, where many subordinate influences, e.g., the size of the lobes of the thyroid body, take effect.

Cæteris paribus, the amount of shifting depends upon (1) the form, thickness, elasticity, etc., of the parts moved; (2) the amount of extensibility of the ligaments connected with the individual parts; (3) the amount of development of the fascias and aponeuroses uniting the various systems of organs together; (4) the amount of deviation of the head from the normal position.

On the Supra-Sternal Space.—Taguchi⁶⁰⁰ has not found, as others have stated, that the superficial layer of the cervical fascia arises from the interclavicular ligament. According to his observations, it arises in the central region of the neck, from the anterior

surface of the manubrium between the origins of the sterno-mastoid muscles, and at each side from the origins themselves. In the region of the fossa supraclavicularis minor it arises from the anterior part of the sterno-clavicular articulation, and the sternal of the clavicle, if the sternal origin of the sterno-mastoid be separate from the clavicular; it then surrounds the clavicular origin of the muscle and springs in the lateral region from the upper border of the clavicle.

MISCELLANEOUS.

On the Preservation of Bodies for Dissection.—John Struthers³³ gives an account of his method of preserving bodies, which will prove useful in the medical schools generally. It consists of four parts: (1) the injection of a solution, in methylated spirit two-thirds and glycerin one-third, of corrosive sublimate, 160 grains (10 grammes) to the half-gallon; (2) the external application of carbolic acid and glycerin in the proportion of 1 of carbolic acid to 8 of glycerin; (3) the storing of the bodies when in hermetically-sealed slate troughs, each one of which should hold but two bodies; and (4) the prevention of or diminution of the drying of the subject during dissection by means of a large water-proof cloth. This method, he suggests, would also be available for embalming bodies for interment at a distance, in which case corrosive sublimate could, with advantage, be substituted for external use. This would also be cheaper than the “Brunelli process,” to which attention has been directed.⁵⁹

Attention has recently been called to the use of “brine as a preservative,”²² in connection with the dissection, by Heinrich Koenig, of Hermannstadt, of 19 bodies of Hungarians, who perished forty-one years ago in an insurrection, and which were found to be in a perfect state of preservation.

Preservation of Anatomical Specimens.—Gombault⁷, recommends the use of rubber cloth to wrap the specimens in, if but a day or two will elapse between the autopsy and the presentation. If a longer time, the solutions of chloral are recommended as best. If the specimens are delicate they should be supported upon an iron-wire frame, the cavities filled with cotton, and the specimen immersed in some alcohol or hardening fluid. For this purpose Müller’s fluid is recommended, the specimen to be subsequently immersed in alcohol.

PHYSIOLOGY.

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BLOOD.

Edington² adds another theory to the many which have already been proposed to explain the origin of the red and the fate of the white corpuscles of the blood. It cannot be said that his theory, in the form in which it is published, at least, has much evidence in its favor. The chief points which are made are as follow: The multinucleated form of the white corpuscles arises from the uninucleated by successive divisions of the nucleus, the daughter-nuclei being eventually liberated. These, in turn, form around themselves a cytoplasm and become again white corpuscles, and so the life history of the white corpuscles runs. As for the red corpuscles, he describes them as originating from much smaller, colorless, spherical cells, not hitherto described, to which he gives the name of albocytes. These increase in size, acquire haemoglobin, and become red corpuscles. The albocytes in turn are produced by endogenous formation within the nucleus of large, white corpuscles, matricytes, from which they are liberated by rupture of the cell. Nothing is said of the origin of the matricytes; so that one is led to infer that the whole development takes place within the blood-current. Considering the fundamental character of the theory proposed, there is astonishingly little in the way of observation or experiment to support it.

Minot³¹⁶ also proposes a new theory of the origin of the red corpuscles, founded partly upon his own observations, partly upon the well-known observations of Schäfer and Ranvier upon the intra-cellular origin of red corpuscles in the vaso-formative cells of the omentum and subcutaneous connective tissues. According to this view the red corpuscles arise as differentiated portions of the cytoplasm of these cells. Minot compares them to the plastids of the botanists, and proposes for the term "red corpuscle," as now used,

the term "blood-plastid." The essential point of his theory is that in the fishes, amphibia, reptiles, and birds the nucleated red corpuscles are homologous with the nucleated red corpuscles of the mammalian embryo; but the red corpuscles, or blood-plastids, of the adult mammal are a new formation arising within vaso-formative cells in the way described.

A third paper, by Howell,²⁴⁸ on the morphology and physiology of the blood-corpuscles, attempts to prove that the development of the red corpuscles in the adult is the same as in the embryo; that they arise, after birth, in the red marrow from colorless cells, erythroblasts, which multiply by karyokinesis; that the daughter-cells, sooner or later, develop haemoglobin in the cytoplasm, and become what are usually called nucleated red corpuscles. These latter cells are at first capable of reproduction by karyokinesis, but the daughter-cells of the first or succeeding generations lose this power, passing into what the author calls the mature form, which is characterized by the greater quantity of haemoglobin in the cytoplasm, and especially by the loss of a chromatin reticulum in the nucleus, the nucleus, in fact, staining a homogeneous color with nuclear stains. After reaching this stage the mature nucleated red corpuscle passes into the non-nucleated stage, the red corpuscle of the circulation, not by absorption of the nucleus as usually taught, but by extrusion or migration of the nucleus as a whole. The evidence for this last point constitutes the chief aim of the paper.

Rollet¹¹³ makes some interesting calculations to show that the quantity of oxygen which may be absorbed by the haemoglobin of the blood is far in excess of that actually required by the body. In a man weighing 150 pounds there are about 5384 grammes ($10\frac{7}{8}$ pounds) of blood, and, counting 5 millions of corpuscles to a cubic millimetre, this will make 25 billions of corpuscles for the whole mass of blood. The superficial area of this multitude of corpuscles will amount to about 3,251,848 square metres. Over this enormous area there are spread 750 grammes ($1\frac{1}{2}$ pounds) of haemoglobin. Now, this quantity of haemoglobin is capable of holding in combination 18 grammes (28 grains) of oxygen. So that if this amount of oxygen were fixed by the haemoglobin every time it circulated through the lungs, and lost again in the systemic circulation, there would be used up in twenty-

four hours about 6912 grammes (14 pounds) of oxygen. Actual experiments, however, show that an average man consumes only 831.7 grammes ($1\frac{1}{2}$ pounds) of oxygen in twenty-four hours, about one-eighth of the amount theoretically possible. The practical deduction made from this calculation by Rollet is, that after a man loses a large proportion of his blood there is sufficient haemoglobin left to carry on the respiratory work of the blood, if only the bulk of liquid in the vessels is sufficient to keep up the circulation. For this purpose, all that is necessary is the injection of normal saline into the vessels, since this liquid is more convenient and less dangerous than defibrinated blood, with its large proportion of fibrin ferment. His conclusion is borne out by experiments upon cats which had been deprived of three-fourths of their blood by haemorrhage. It may be added, also, that the conclusion is in harmony with surgical experience upon the human being. Röhmann and Mühsam²⁴⁶ attempt to determine whether there is any difference in the total dry residue of arterial and of venous blood. When care was taken to collect the specimens of blood without causing any stasis, they found that there was no difference between the two. When, however, the method of collecting the venous blood was such as to cause a stoppage of the circulation for some time, as in the insertion of a canula, then, as others have shown, the dry residue of the venous blood was greater. This is explained by the work of Cohnstein and Zuntz (see ANNUAL, 1889), who showed that under such conditions there is an increase in the number of corpuscles in the stagnant blood and a corresponding diminution in plasma. Röhmann and Mühsam prove in a similar way that the amount of fat in arterial blood after a meal is the same as in venous blood, provided the above precaution is taken of collecting the venous blood without interruption of the circulation. The importance of the work lies in emphasizing the precautions which must be taken in judging of the function of any organ by analyzing the blood as it enters and leaves the organ. The results of their work, in fact, seem to indicate that the loss of the blood in any of its constituents in one passage through the systemic capillaries is too slight for our methods of analysis to detect. This conclusion contradicts the view which has usually been held.

Ringer and Sainsbury¹⁷⁸ present more completely than has

been done heretofore the importance of the inorganic salts in the clotting of blood and milk. In the coagulation of blood a certain amount of inorganic salts has always been assumed to be necessary to the formation of fibrin, but inasmuch as inorganic salts are necessary to hold fibrinogen in solution the statement did not seem to mean much. The authors attempt to show that the inorganic salts may take a very essential and direct part in the process of clotting. The lime salts seem to be the essential constituent; their presence facilitates clotting in a striking way, while complete absence of them makes coagulation impossible. It cannot be said that this last statement is rigorously demonstrated. The strontium and barium salts have an action similar to that of calcium, though not so marked. On the other hand, potassium and sodium salts tend to restrain or to prevent the formation of fibrin. The relationship of the lime salts to living matter is beginning to force itself upon the attention of physiologists, largely on account of the experiments of Ringer. (See ANNUAL, 1888.) Their remarkable action upon the heart, for instance, may be taken as an indication of their possible effect upon other tissues. Their effect upon the development of ova and of the tadpoles is shown by Ringer¹⁸⁷ in a recent contribution. Just in line with this work are some experiments of Arthus and Pagès.⁴¹⁰ They assert, also, that the lime salts are necessary both to the coagulation of blood and of milk. (See "Digestion.") According to them, anything added to the blood which will precipitate the calcium will prevent the clotting. As examples of such substances, they mention the oxalates and fluorides of the alkalies and ordinary soap. The oxalates are particularly efficacious, as less than 1 gramme (15 grains) added to a litre (1 quart) of blood will prevent its coagulation. Blood treated in this way will not clot when diluted, as is the case after the action of salts like sodium sulphate, but if calcium chloride is added clotting is again possible. Moreover, they assert that fibrinogen obtained from blood in which the calcium has been precipitated by the addition of oxalates will not clot under the influence of fibrin ferment. The theory of coagulation proposed by them is that the fibrinogen, under the influence of the ferment and in the presence of lime salts, is converted into, or gives rise to, an insoluble calcium compound, viz., fibrin. The fibrin factors, then, according to this theory, are fibrinogen, fibrin ferment, and lime salts. Schenck²⁴⁶

states that if one adds a given quantity of grape-sugar to a solution containing albumens in solution, *e.g.*, serum or lymph, and then coagulates all of the albumen by heat or by ammonium sulphate, all of the sugar cannot be obtained from the filtrate and the washings of the coagulum. Furthermore, if the coagulum, after the most complete washing, is treated with dilute HCl, sugar (or a reducing substance) can be obtained from it. The probable conclusion seemed to be that the sugar had entered into some sort of a chemical combination with the proteids. The author drew this conclusion, but in a later publication has taken it back, and admits, in consequence of new experiments, that the sugar is held by the precipitated albumens in such cases in some sort of mechanical combination. His experiments show the precautions necessary in analyzing the blood for sugar.

MUSCLE.

Some of the most interesting and suggestive work which has appeared during the year comes from Mosso's laboratory, and deals with the subject of muscle fatigue.⁸²⁰ *Physiol. Abh., p. 60.* His experiments were made with an instrument to which he gives the name of ergograph, an illustration of which is given on next page. The construction of the instrument is very simple. It consists of an apparatus to hold the arm and hand steady, so that the contractions of the flexors of the middle finger can be registered. A band encircling this finger is connected by a cord with a carriage (O, R) working on parallel rods, and carrying a feather or pen (Q), which records the movements of the carriage on a revolving drum. Weights of 3, 4, or more kilogrammes were used for the finger to lift, and in each case the finger was contracted with the greatest possible force, and at definite intervals, until complete fatigue appeared. The line joining the tops of these contractions make the fatigue curve; examples of this curve are given in the figures on page 7. The more important results obtained by Mosso are as follow: The curve of fatigue varies for each individual. Two striking curves illustrating this individual variation are given in the illustration. At different seasons of the year the same person may give somewhat different curves, but the difference is more in the extent of the curve than its form, and depends, probably, upon variations in the general nutritive condition of the body and of the muscles employed.

When the flexor muscles of the finger were stimulated by induction shocks following the same rhythm as in the first experiments, the curve of fatigue for any one person had the same form as when voluntary stimuli were used. It is worthy of note that Mosso, like Fick and others, found from his records that the voluntary impulse is more effective as a stimulus than the electrical current; that is, it may call forth a greater contraction. With reference to the manner of action of these two forms of stimuli, Mosso puts on record a curious observation. If, during a series of contractions, the artery of the arm was compressed so as to make the limb

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RECORDING PORTION OF THE ERGOGRAPH. (Mosso.)
(Archiv f. Anat. u. Physiol.)

completely anaemic, voluntary impulses were unable to call forth muscular contractions; but the less efficient electrical stimulation, applied directly to the nerves, was sufficient to produce contractions. In other words, interruption of the circulation affects the nerve-fibres in some way, so that they will conduct an impulse aroused by an electrical current, but not one produced by the action of the will. This adds another difficulty to the understanding of the nature of the nerve-impulse or nerve-current. Muscular fatigue, as it comes on under normal conditions of life, is due partially to fatigue in the muscles and partially to fatigue of the centres innervating those muscles. The centres being most sus-

ceptible to fatigue are chiefly affected, and are directly responsible for the first loss of power to contract the muscles. This is shown by an experiment of the following kind: After a muscle, from repeated voluntary contractions, is brought into a condition of complete fatigue, direct stimulation of the muscle or of its nerve will cause contraction, proving that the nerve-centres become fatigued before the muscles. Muscular fatigue in general is attributed directly to the accumulation in the muscle of fatigue substances formed during contraction. Maggiora, in an article reviewed below, gives a number of experiments to prove that strong fatigue of muscles in one part of the body will produce partial fatigue in the other muscles. For example: After a long

CURVES OF FATIGUE FROM TWO INDIVIDUALS. (Mosso.)
(Archiv f. Anat. u. Physiol.)

tramp, prolonged to the point of great fatigue, the muscles of the finger are also partially fatigued; their fatigue curve, taken by the ergograph, is much shorter than under ordinary conditions. In a similar way Mosso shows that excessive mental exertion may have a similar effect upon the muscles of the fingers, causing their fatigue curve to become shorter than usual. The apparent explanation is that, in functional activity of the brain, fatigue substances are formed in such quantities that they cannot be eliminated from the body as rapidly as they are produced; they accumulate in the blood, therefore, and may affect the muscles and possibly the nerve-centres in other parts of the body. If voluntary and electrical (induced current) stimuli are applied to the motor nerve of the

finger at the same time, instead of getting a summation of effects, as might be expected, an inhibition is obtained, so that the contractions are lower than they would be with either form of stimulus alone. In addition, a definite contracture is developed in the muscle.

Mosso asserts that the inhibition in this case is strictly comparable to the inhibition of the heart's action by the vagus, though his reasons for this view are not clearly presented. With reference to the contracture obtained under certain circumstances, the extent of it varies for different conditions. It is much more marked in muscles stimulated artificially, by electrical currents, than with the same muscles under natural stimulation. When electrical stimuli are used the contracture increases with the strength of the stimulus and with the rate of stimulation. Mosso regards the development of this condition not as a defect, but as a quality useful to the muscle. Thus, it is possible, under certain circumstances, as in fatigue from prolonged muscular contraction, that the establishment of this condition of contracture might keep the muscle in a partially contracted condition and prevent an absolute loss of power. Using the same apparatus and methods of work, Maggiora⁸²⁰ studied in more detail the laws governing muscle fatigue. The paper is long, and the results can be given best in the form of a brief *résumé*. When the finger was weighted with 2 kilos and contractions were made up to complete fatigue, more work was obtained from the muscles than when a larger weight, 4 or 8 kilos, was used. This result conforms to the general law that for each muscle there is a given load with which the maximal amount of work can be obtained. When the weight was kept constant and the interval between the successive contractions was varied, he found that with an interval of ten seconds and a load of 6 kilos the contractions were all of the same height; there was no fatigue. In other words, the ten-second interval was sufficiently long to allow the muscle to recover completely from the effects of the preceding contraction. It is interesting to compare this interval with that required by the heart-muscle,—about half a second. Using an interval of two seconds between the contractions and a weight of 3 kilos, the muscles quickly become fatigued. Maggiora determined, under these conditions, how long a rest is necessary for the same muscles with the

same interval and load to recover completely; that is, to give a series of contractions as good as the first one obtained. To obtain this result he found that a rest of at least two hours was necessary. So that to get a maximal amount of work from the muscles during a day it would be preferable to give a longer interval—ten seconds—between the contractions, rather than to work the muscles down to complete fatigue and then give a longer rest—two hours—until the muscles had recovered. For any given period of exertion the least amount of mechanical work was obtained when the muscles contracted at intervals of four seconds, but without any periods of rest; while the maximum work was obtained when the contractions were made at intervals of two seconds, but were arranged in groups of 30, with one minute of rest between the groups. In explanation of this last result, it was found that, if in any series of contractions the experiment was stopped before the last few contractions preceding complete fatigue were made, the fatigue of the muscle was less marked and the recovery was much more rapid than if the few remaining contractions had been made and the muscle worked to absolute fatigue. In other words, to put the results in the form of a hygienic law, straining a muscle is much more injurious than a far greater amount of work before fatigue begins to be felt. If the muscle contracting was made anæmic by compressing the artery, fatigue came on much more rapidly, or, as the author expresses it, anæmia brings on symptoms similar to those of fatigue.

In this last experiment, where the pressure on the artery was removed and blood again allowed to circulate through the muscles, recovery from the fatigue took place in a much shorter time than was necessary for its development in the anæmic muscle. One can explain this satisfactorily upon the chemical theory of fatigue. After shutting off the blood-current a certain length of time will be necessary for the development of a sufficient quantity of the fatigue substances to prevent contraction; but after the circulation is again established the excess of fatigue substances is quickly washed away by the blood-stream. The power of a muscle to do work is influenced not only by the work previously done by that muscle, but by the contractions of the other muscles of the body. This fact, familiar enough in every-day life, receives an experimental demonstration in Maggiora's work. He proved that a

long walk had a very decided effect upon the fatigue curve of the flexors of the fingers. The length of walk necessary to bring out this effect varies, of course, with different individuals, but in general the exertion had to be carried to the extent of causing a strong feeling of fatigue. We may infer from this that the fatigue substances formed, during contraction, in any muscle or group of muscles, are carried over the body in the blood and lymph, and affect the other muscles and nerve-centres in proportion to their quantity. Similarly a sleepless night had a remarkably distinct influence upon the fatigue curve of the flexor muscles. Fasting also quickly affected the power of the muscles to do work. In this case the curve showed that the first contractions were as good as those obtained in a well-nourished condition, but that they ran down much more rapidly, making the fatigue curve shorter. The recovery of their normal condition by the fasting muscles, after partaking of a meal, took place in an astonishingly short time,—from one-half to three-quarters of an hour. In this, as in some of the other experiments, the flexor muscles were stimulated by electrical currents as well as by voluntary effort, the results being the same with the two forms of stimulation, and proving that the phenomenon was dependent upon a condition of the muscles themselves, and was not a result of the action upon the nerve-centres. The effect of massage upon the arm was very remarkable. The condition of the muscle, after fasting, was immediately and strikingly improved by massage. So with a weight of 3 kilos and an interval of two seconds. A series of fatigue curves were taken, allowing only fifteen minutes' rest between each set. This insufficient rest soon showed itself in a marked shortening of the fatigue curve. But if, during each fifteen minutes' rest, the muscles were subjected to massage, the fatigue curve remained normal, or nearly normal, for a very much longer time.

While engaged in some of the same work in Mosso's laboratory, Lombard²⁶³ discovered a fact with reference to the muscle contractions which is unexpected and very interesting. He found that, taking his fatigue curve in the way explained and making the strongest contractions of which he was capable, the height of the contractions soon sank to a minimal point. If, however, he still continued to make the strongest voluntary efforts to contract the muscle, the contractions, instead of disappearing completely,

as a result of absolute fatigue, suddenly returned to something like their normal size, without any apparent reason. If he still continued to contract his muscles, or to make voluntary efforts at contraction, the height of the contractions sank quickly again to a minimum; but if the efforts were persisted in, a second partial recovery took place, and so on for a number of times. To what are these periodic returns of contractility in a muscle under constant stimulation due? Obviously it might be a peculiarity in the fatigue of the nerve-centres involved, or of the peripheral tissues, namely, the efferent nerve-fibres, the end plates, or the muscles themselves. Lombard proves satisfactorily that it is not a phenomenon of the muscle or of the nerve-fibres. Massage of the muscles, though causing an improvement in the size of the contractions, did not affect the periodicity. So, direct electrical stimulation of the motor nerves, ulnar and median, though giving a typical fatigue curve, caused no periodic variations. Lastly, when from voluntary stimulation the muscle contractions had sunk to a minimal height, direct electrical stimulation of the muscle or nerve gave good contractions, showing that the muscle was still unsatigued. On the other hand, the periodicity in the contractions does not seem to have been due to any oscillations in the will-power, since during the period of minimal contractions of the flexors of the finger no difficulty was experienced in obtaining maximal voluntary contractions from other muscles. Apparently, then, this periodic loss and recovery of function during fatigue is a property either of the voluntary centre, *i.e.*, cortical centre, governing those muscles, or more likely a property of the lower spinal motor centres innervating those muscles. It is a most interesting phenomenon, and may be related, as the author suggests, to other periodic variations in activity of nerve-centres under continuous stimulation, such as the rise and fall in the acuteness of auditory or visual sensations so commonly experienced.

Haycraft,¹⁷⁸ goes over a number of the experiments made to determine the rate of discharge of the nerve-centres in reflex and voluntary contractions, or the tetanic nature of such contractions and the number of simple contractions of which they are composed. He criticises unfavorably the methods hitherto used to settle this question, such as the period of the muscle-tone and the analysis of directly-taken graphic tracings. The muscle-tone he thinks may

be explained by the fibrillar or fascicular character of the muscle contraction, the contractions of the fasciculi following in sequence, or at least not occurring simultaneously. The aperiodic trembling or vibration thus produced may throw the tympanic membrane into vibration, he thinks, and thus cause the muscle-tone. It cannot be said that his experiments bear out satisfactorily this theory. As for the direct records of voluntary contractions, such as those published by Horsley and Schäfer, which indicated a discharge of ten contractions to a second, he is inclined to explain the result as owing to the periodicity of the instrument used in recording the contractions. While he is not prepared to deny the compound nature of voluntary contractions, he believes that the evidence hitherto offered is unsatisfactory and misleading. One fact of interest that the author gives from his own experiments is the result of direct stimulation of the nerve-centres. He found that when the cord or the base of the brain is stimulated with electrical currents the muscles respond with tetanic contractions of the same rate as the stimuli used, as shown by the pitch of the muscle-tone. On the contrary, stimulation of the cortical motor areas gives always, no matter what the rate of stimulation, the ordinary muscle-tone supposed to be due to the fusion of twenty single contractions to the second. Presumably, in stimulating the cord and base of the brain, the author was exciting the conducting motor paths, *i.e.*, nerve-fibres, while in stimulating the cortical centres he was exciting nerve-cells. The difference in the results in the two cases goes to support the general view of a fixed rhythm of discharge for the nerve-cells,—a view which the balance of the paper seems to criticise adversely. From a histological study of the spermatozoa of various animals, the details of which are not given in this paper, Ballowitz²⁴⁸ comes to the conclusion that the axial thread of the tail is fibrillated. In most spermatozoa the axial thread is a clear strand running from the head through the middle piece and main piece and emerging at the end as the so-called end piece. It is supposed to be the contractile portion of the tail. In the spermatozoa of the amphibia the axial thread is not contractile and, histologically, shows no fibrillation. The motile membrane in these spermatozoa, on the other hand, is fibrillated. The significance of his work is his endeavor to support the general proposition that all contractile tissues—muscle, cilia,

spermatozoa—have a fibrillated structure. He reviews the recent literature in an effort to corroborate this view from current bibliography.

NERVOUS SYSTEM.

Perhaps the most valuable contribution to our knowledge of the circulation in the brain and its variations under physiological and pathological conditions which has appeared within recent years is found in the work of Roy and Sherrington.¹⁷⁸ v.n.p.s

To measure the changes in the circulation in the brain, a trepan hole was made through the skull of the animal experimented upon, and into this hole a bell-shaped metal capsule was fitted so that it could be easily fastened by thumb-screws to the edges of the bone. The dura mater was cut away, and the bottom of the metal capsule was closed by a thin, flexible membrane, such as Roy has used in his tonometer and oncometer. The capsule was connected by tubing with a recording-lever. The variations in general arterial pressure were measured in the usual way by a canula inserted into the femoral artery. Their work showed in general that any condition which will raise general arterial pressure, such as stimulation of sensory nerves, dyspnœa, anæmia, etc., will at the same time cause congestion of the brain. The physiological explanation is simple: the general constriction of arteries over the body forces an excess of blood into the brain. The authors make an ingenious suggestion as to the physiological value of this indirect method of regulating the central circulation. Anæmia of the brain,—of the base of the brain, at least,—however brought about, will act as a stimulus to the vasomotor centre; the action of this centre will cause an increase of blood-pressure over the body at large, and thereby force the excess of blood into the brain. In this way the anæmia of the brain is compensated by a self-regulating action. In the same way one can explain the physiological value of the rise of arterial pressure, or, rather, of the general vaso-constriction, which results from a stimulation of sensory nerves. For the congestion of the brain thus indirectly produced implies a quickened functional activity which may be regarded as beneficial to the response which the sensory stimulus calls for. The effects of various medicinal and narcotic substances upon the brain-circulation were also determined. Chloral hydrate causes anæmia of the brain, due in part, if not altogether, to a

direct action on the cerebral blood-vessels. Ether, when inhaled, causes at first anæmia, followed by congestion. Morphine produces an anæmic condition, while potassium bromide, strychnine, and caffeine cause congestion. Intra-venous injection of acids brings on in all cases a marked congestion, while the fixed alkalies have just an opposite effect. Ammonia, on the contrary, produces congestion. The marked effect of the acid leads the authors to suppose that we have in it an intrinsic mechanism for the local regulation of the blood-supply of the brain. It is well known that functional activity or anæmia of the brain is followed by the development of an acid reaction, owing to the formation, probably, of lactic acid. The mere presence of the acid under these circumstances should lead to a dilatation of the vessels and a local congestion, thus meeting the needs of the tissues involved. With regard to the much-discussed question of the existence of special vasomotor nerves to the brain, they give some results which seem to be quite conclusive. Previous investigators of the subject have stated that in some cases stimulation of the central end of the divided vagus or vago-sympathetic caused cerebral congestion, while in other cases it was followed by anæmia. Roy and Sherrington got similar discordant results, which at first they were unable to explain. Later they discovered that if they stimulated the peripheral instead of the central end of the vagus they might get congestion or anæmia of the brain without any simultaneous effect upon arterial pressure. But, invariably, a congestion of the brain produced in this way was followed by a rise of pressure in the veins, and anæmia of the brain by a fall of venous pressure. It would seem from this that some of the veins—those leading from the head to the heart—are provided with vasomotor fibres capable of causing directly either a constriction or a dilatation, and that the effect of stimulation of the vagus on the brain-circulation is a secondary and passive effect from the venous constriction or dilatation. With reference to the vasomotor nerves of the brain-vessels, they conclude, then, that they do not exist, but that the brain-circulation is regulated partly by the local production of acid in functional activity, and partly from the changes in arterial or venous pressure in the remainder of the body. (With reference to their hypothesis of vasomotor nerves to the veins, see "Circulation," article by Mall, page 29, this section.)

A second paper upon the circulation in the brain is by De Boeck and Verhogen.²⁷⁶ Their methods were entirely different from those of Roy and Sherrington. They kept record of the general arterial pressure of the animal experimented upon, and measured the flow of blood through the brain by inserting a canula into the jugular after ligating all the branches not coming from the brain. The flow of venous blood from the canula was recorded by the apparatus of Marey. In addition, they attempted to determine the rate of flow in different parts of the brain by variations in temperature as measured by thermo-electric needles or buttons applied directly to the brain. They do not make out the same invariable inverse relationship between general arterial pressure and brain flow that Roy and Sherrington emphasize so strongly. Asphyxia, however produced, caused an increased flow of blood through the brain, along with the constriction and rise of pressure in other parts of the body. Subcutaneous injection of ether also caused an increased flow through all parts of the brain, along with a rise of general pressure, though both effects were slower in appearing and more gentle than in the case of asphyxia. Intravenous injection of morphine caused a lowering of blood-pressure and an anæmic condition of the cortex of the brain ; but, inasmuch as the flow of blood from the brain was not altered, they concluded that there must be a compensatory increase in flow, or hyperæmia of the base of the brain. As collateral evidence for this last assertion, they quote the results of ophthalmoscopic examination. In the main their results do agree with those of Roy and Sherrington in the chief point, that the flow of blood through the brain is increased by general constriction in the rest of the body, and *vice versa*.

V. Koranyi,²⁴⁸ under the guidance of Goltz, made a number of experiments upon the effect of dividing the corpus callosum. The operation is a difficult one. When it was entirely successful and neither hemisphere was injured, no distinct results of the lesion could be observed. In cases where the hemispheres were injured, there were more or less marked disturbances of vision, sensation or movement, which, however, seemed to be only temporary. A more careful, or at least more successful, study of the corpus callosum has been made by Mott and Schäfer.⁴⁷ Their work amounted to a physiological demonstration that the corpus

is made up of commissural fibres passing from cortex to cortex of the two hemispheres. Stimulation of the corpus, either from above through the longitudinal fissure, or from the side after removal of one hemisphere, caused definite muscular movements. When the stimulation was from above, the two hemispheres being intact, the resulting movements took place symmetrically on the two sides of the body. If either hemisphere was removed or its cortex destroyed the movements were unilateral, being confined to the side controlled by the uninjured hemisphere. This proves that the fibres of the corpus callosum do not pass directly into the internal capsule, but are secondarily connected with the motor tracts through the motor centres of the cortex. No strict massing of similar fibres could be determined for the different portions of the corpus. To some extent, at least, the fibres passing to or from any one area are scattered along the middle portion of the commissure. The operative difficulties seem to have been very great, so that the results of stimulation of the splenium and of the rostrum were not so satisfactory as in the case of the middle portion.

Thompson and Brown,¹⁰⁰⁷ report a number of experiments made upon dogs, cats, and monkeys to determine the location of the visual centres. It was found that, in the cat and dog, lesions of the occipital lobe, if sufficiently deep, were followed by total blindness in the opposite eye, vision on the operated side not being affected. This result is different from what is observed upon the human subject in cases of pathological lesions involving the same lobe of the brain, and different, also, from experimental lesions of the same lobes in monkeys. These experiments in the latter animals were limited, but indicated that destruction of the occipital lobes was followed, as in man, by homonymous hemianopsia. If these results on dogs and cats are correct, it would indicate that there is a complete decussation of the visual fibres in the optic chiasma in these animals. If the experimental lesion of the optic lobe was comparatively shallow (cat and dog), the blindness of the opposite eye was only temporary, lasting from a day to six weeks. In order to insure permanent blindness, it was necessary to make the incision in the cat 0.5 centimetre deep and 2 centimetres in diameter; in the dog, 1 centimetre deep and 3 centimetres in diameter. Destruction of the angular gyrus in the monkey gave them no disturbances of vision, their experiments in this particu-

lar corroborating the previous work of Schäfer and Brown, as opposed to the well-known views of Ferrier. As a temporary result of injury to the occipital lobes, they observed hemianæsthesia lasting for a variable time.

All physiologists will remember the discussions in the textbooks of physiology, a few years ago, with reference to the action of the submaxillary ganglion. The secretory nerve to this ganglion leaves the lingual near the point where the duct of Wharton crosses it, the fibres then passing to the gland along the course of the duct. At the angle between the lingual and chorda, or, according to later authors, along the course of the chorda on its way to the gland, there is found the submaxillary ganglion, one of the peripheral ganglia of the body. Claude Bernard asserted that a reflex secretion could be obtained through this ganglion. He cut the lingual and chorda above the ganglion, and then found that stimulation of the sensory fibres of the lingual, below the ganglion, or of the tongue itself, caused a flow of saliva. Schiff, while corroborating Bernard's experiment, gave it another explanation. He showed, or stated, that all the secretory fibres of the chorda tympani do not leave the lingual with the main bundle. Some of them run several centimetres farther in the lingual toward the tongue and then bend backward to reach the gland along with the first group of fibres. According to this interpretation, it was these recurrent fibres which Bernard stimulated, and the secretion was, therefore, not reflex but direct. Wertheimer⁴¹⁰, goes over the experiments of Schiff and asserts that his results are not correct; at least, not in all cases. Like Schiff, he did his operation in two stages. First, he cut the lingual below the ganglion, at varying distances, and allowed the animal to live for six or ten days. If in this portion of the lingual there were any recurrent fibres, then by this time they should have lost their irritability and begun to degenerate, while the sensory fibres, being still in connection with their centres, ought to be intact. At the end of this period the dog was anaesthetized a second time and the lingual and chorda cut above the ganglion. If, now, the central end of the lingual stump below the ganglion was stimulated, a distinct secretion was obtained. This result can only be explained in two ways. Either there was an escape of current to the intact gland-fibres at the level of the ganglion, some 4 centi-

metres distant from the point of stimulation, or there was a true reflex secretion through the submaxillary ganglion. The first explanation is not probable, especially as the author does not seem to have thought it necessary to consider it. If the work can be corroborated by others it will establish a fact of far-reaching importance. If reflex acts can be obtained through the peripheral and sympathetic ganglion, a new field of speculation and experiment will be opened to the physiologist.

Some years ago, Bowditch showed that continuous stimulation of a nerve for hours did not appear to cause fatigue. The experiment made was to place a cat under curare and stimulate the sciatic nerve continuously with induced currents sufficiently strong to tetanize the *m. tibialis anticus*. After four or five hours, as the effects of the drug were wearing off, the muscle began to contract; the contractions, however, were not tetanic, as one would have supposed, but at first single contractions occurred at intervals, and finally these became irregularly tetanic. The experiment showed that the nerve was still irritable, but the peculiarities of the first contractions might be explained as due to a partial fatigue. To determine this point, Bowditch ⁸²⁰ has made a new series of experiments in which dogs were placed under curare, and the nerve was not stimulated until the effects of the drug had begun to wear off. The same irregularities in the first contractions appeared, showing that they are due to some action of the curare upon the nerve-muscle apparatus. This new series, therefore, strengthens still more the conclusion drawn from the first experiments, namely, that the nerve-fibres are not fatigued after several hours' continuous stimulation. A second contribution upon the same subject is made by Rolleston. ¹⁷⁸ He endeavored to measure the increase in heat, if any, which occurs in a nerve in functional activity. For this purpose he made use of a new and delicate thermometer invented by Callendar. It is composed of several turns of pure platinum wire, and the principle upon which it works is, that the electrical resistance of a metal wire varies approximately with its temperature. With the apparatus as it was used a difference of $\frac{1}{5000}^{\circ}$ C. ($\frac{9}{25000}^{\circ}$ F.) could be detected. In the experiments the sciatic nerve was taken and wound around one of the thermometers. In some cases the muscle was left in connection with the nerve to serve as an index of its irritability; in

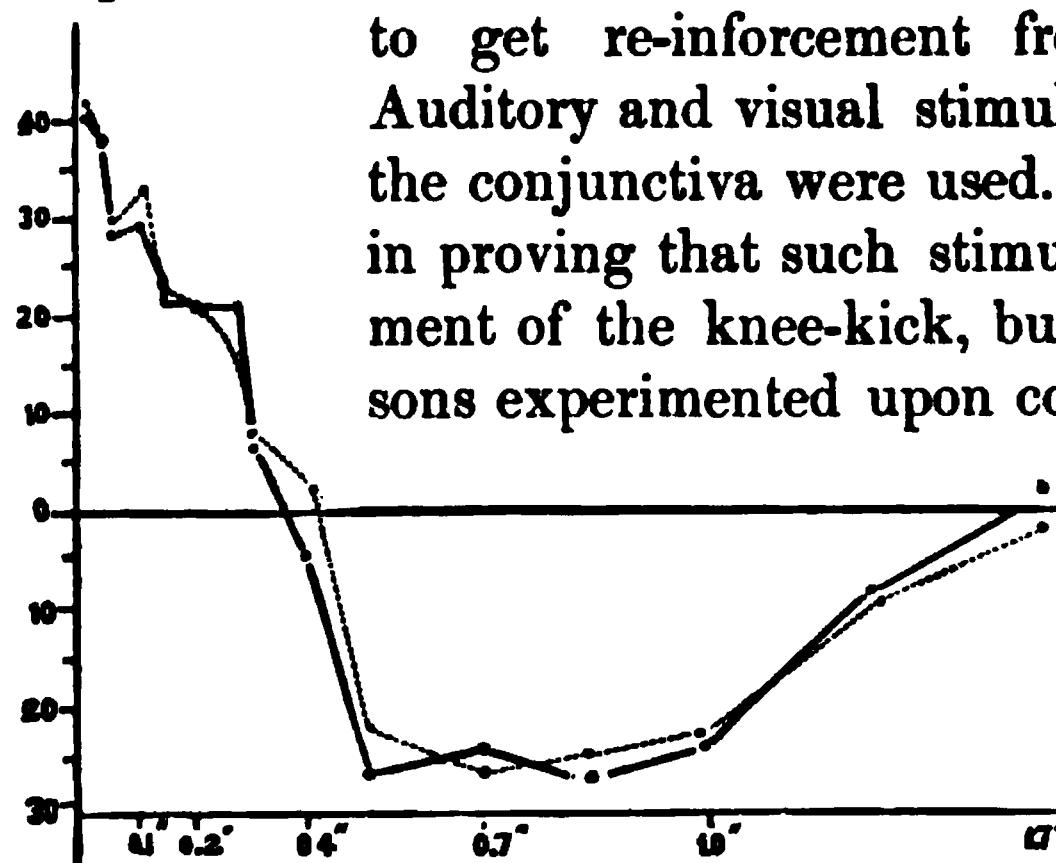
other cases, the same end was reached by measuring the negative variation. In no case could he detect any rise of temperature in the nerve during the passage of an impulse. If the nerve-impulse is essentially a series of progressive katabolic chemical changes, it should be attended by an increased production of heat, and continued functional activity should result in an accumulation of waste products leading to fatigue. The two researches reported, like those previously undertaken to determine these points, give entirely negative results, and would lead us to believe that the transmission of the nerve-impulse is in reality a physical phenomenon,—a vibratory motion of some character. Though, of course, there remains the possibility that the supposed chemical changes constituting the impulses may be of such a minimal character that the production of heat is too slight to be detected, and the waste products so trifling that accumulation of them in sufficient quantities to cause fatigue is impossible under ordinary conditions.

The physiology of the knee-jerk phenomenon has been investigated by American observers with special success during the last few years. A recent contribution to the subject from the Harvard laboratory, by Bowditch and Warren,¹⁷⁸ v.ii, p. 28 contains a careful study of the so-called re-inforcement of the knee-kick. It has been known for several years, that, if at the time the blow upon the knee is struck the subject of the experiment makes a voluntary muscular movement, such as clinching the hand, the kick will be greater than normal.

Bowditch and Warren have determined, with reference to this act, the influence of the time-interval between the blow upon the knee and the re-inforcing muscular contraction. They discovered that the re-inforcement followed in all cases, provided the interval between the re-inforcing act and the blow did not exceed a certain limit—0.4". If the interval was longer than this they obtained what they call negative re-inforcement; that is, the kick was less than normal. If the time-interval was prolonged to 1.7" or 2", the re-inforcing act was entirely without influence upon the knee-kick. The figure on next page gives a clear presentation of these results. The numerals on the abscission line give the time-interval between the re-inforcement act and the blow; the ordinates represent the extent of the kick above or below the normal, which is

represented by the zero line. This negative re-inforcement is an entirely new discovery, and one of great interest. The natural suggestion that the apparent inhibition may be, in reality, only a result of simultaneous stimulation of the antagonistic muscles is not considered a sufficient explanation by the authors; they regard the phenomenon as a genuine case of inhibition. It is easy to conceive how a simultaneous discharge from other centres in the central nervous system might augment or inhibit the discharges from the spinal centres governing the knee-kick; but that any one discharge may augment or inhibit another, according to the time-interval between the two, is more difficult to explain, unless we adopt the interference theory of inhibition. The authors attempted

to get re-inforcement from sensory stimulation. Auditory and visual stimuli and blasts of air upon the conjunctiva were used. No difficulty was found in proving that such stimuli may cause a re-inforcement of the knee-kick, but in only one of the persons experimented upon could an inhibition also be obtained.



CURVES SHOWING AVERAGE MUSCULAR RE-INFORCEMENTS. (BOWDITCH AND WARREN.)
(*Journal of Physiology.*)

Acting upon a suggestion of Weir-Mitchell, Reichert has made a number of experiments upon dogs, to determine whether the knee-jerk can be re-inforced after the spinal cord is severed

from connection with the brain. After section of the cord Reichert was not able to obtain either a re-inforcement or an inhibition of the reflex from simultaneous stimulation of the sensory nerves of the other leg, or of the peripheral end of the divided spinal cord. He concludes, therefore, that the re-inforcement and inhibition obtained in the human subject are dependent upon the action of the cerebral centres. Waller¹⁷⁸ still contends that the knee-jerk or tendon reflex is not a reflex act, but a direct muscular contraction. Waller brings forward some weighty evidence for his view, though it is not more conclusive than that offered to prove the reflex nature of the phenomenon. His experiments were made upon rabbits, and his results, briefly stated, are as follow: Direct

electrical stimulation of the rectus femoris in the rabbit shows a latent period, or lost time, of 0.0076"; direct mechanical excitation of the same muscle, 0.0078". For the same animal the tendon reflex required an interval of 0.0080" between stimulation and response, while an ordinary reflex from stimulation of the skin required 0.0333", and from mechanical stimulation 0.0360". The difference in lost time between the knee-kick and an ordinary reflex is very great. On the other hand, the lost time for the knee-jerk is practically identical with the latent period of the muscle whose contraction gives the kick. It cannot be contradicted that destruction of any part of the reflex arc abolishes the knee-kick; so that Waller is forced to the unsatisfactory conclusion that the knee-kick is a direct muscular contraction, but that the "integrity of the nervous arc is its *sine qua non* condition." The nature of the act remains, then, in its former undecided condition.

CIRCULATION.

From a careful post-mortem examination of the inter-auricular septum of the human heart, Firket,⁵² states that in something over 25 per cent. of the adult subjects there is either a distinct foramen or a cleft piercing the septum. Under conditions which will cause a rise of intra-auricular pressure, such as interference with the pulmonary circulation, there may follow a passage of blood through the septum from one auricle to the other. In the author's opinion this communication, while probably insufficient to produce cyanosis, may augment considerably the danger of asphyxia.

Kasem-Bek,²⁴⁶ repeats the experiments of Ludwig and Dogiel on the heart-sounds in hearts without blood. In some cases the heart was removed from the body; in others the ventricle was deprived of blood by compression of the auricles of the exposed heart. In all cases the first sound could be heard after the heart was bloodless, the tone being the same as that given by the heart under normal conditions. The second sound, on the contrary, disappears after the quantity of blood becomes too small to effect a closure of the valves. The authors conclude that the first sound is essentially muscular in origin, the closure of the auriculo-ventricular valves taking only a subordinate part, if any at all.

By means of the capillary electrometer Waller,⁴¹⁰ has been

able to demonstrate an electrical variation in the human heart corresponding with the systole of the ventricles, and similar to that so often demonstrated on the isolated or exposed heart of the lower mammalia,—the so-called negative variation or action current of the heart contraction. By making a simultaneous record of the contractions of the heart Waller was able to show that the electrical change precedes the mechanical shortening of the muscle, as is

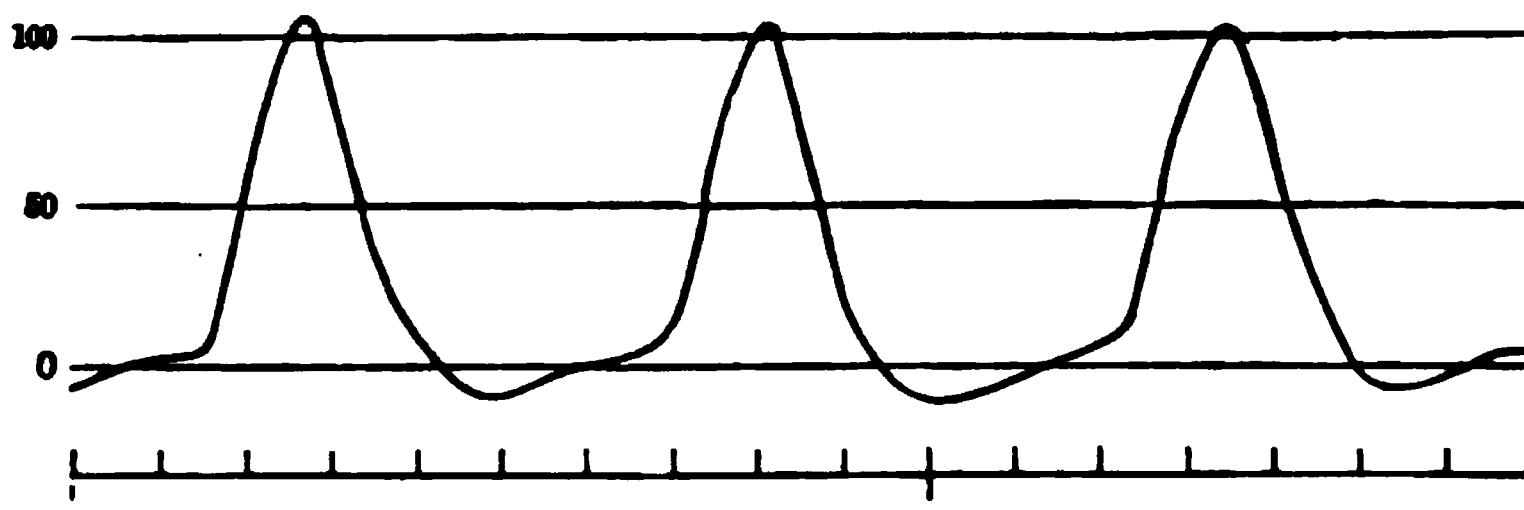
DIAGRAM OF THE DISTRIBUTION OF ELECTRIC POTENTIALS OVER THE BODY
DURING CARDIAC SYSTOLE. (WALLER.)
(Archives de Physiol. Norm. et Path.)

the case in the skeletal muscles. Moreover, he finds that the electrical changes are diphasic, that first the apex of the ventricle is negative to the base, and subsequently the base becomes negative to the apex. Assuming that negativity is the sign of functional activity, he infers that the systolic contraction passes in the form of a wave from the apex to the base of the ventricle. This conclusion is certainly opposed to our usual conception of the direction of the wave of contraction in the ventricle; in fact, it

would seem to be in direct contradiction to Gaskell's experiments and theories upon the sequence of contraction in the cold-blooded heart. At the contraction of the ventricles, not only is the electrical condition of the heart itself changed, but of the remainder of the body likewise. The disposition of electric potentials is such that, when the apex of the heart is negative to the base, most of the trunk of the body, the legs, and the left arm are also negative with reference to the base of the heart, and to the head, upper portion of the trunk, and right arm. This unsymmetrical distribution of potentials is governed by the position of the heart in the thorax, as shown in the accompanying cut. A consideration of this figure will show that if the electrodes leading off to the capillary electrometer are connected with any two points of the legs, or of the legs and left arm, points A A of the figure, no electrical change will follow during the heart contraction. On the contrary, any two points, such as A B, will give a diphasic variation similar to that described for the apex and base of the heart. In two cases of transposition of the heart the potentials suffered a corresponding change, as will be understood from a glance at the figure. In the cat, in which the heart lies nearly in the mid-line, the distribution of potentials divides the body symmetrically into an upper half, following the electrical condition of the base of the heart, and a lower half whose potential is similar to that of the apex of the heart.

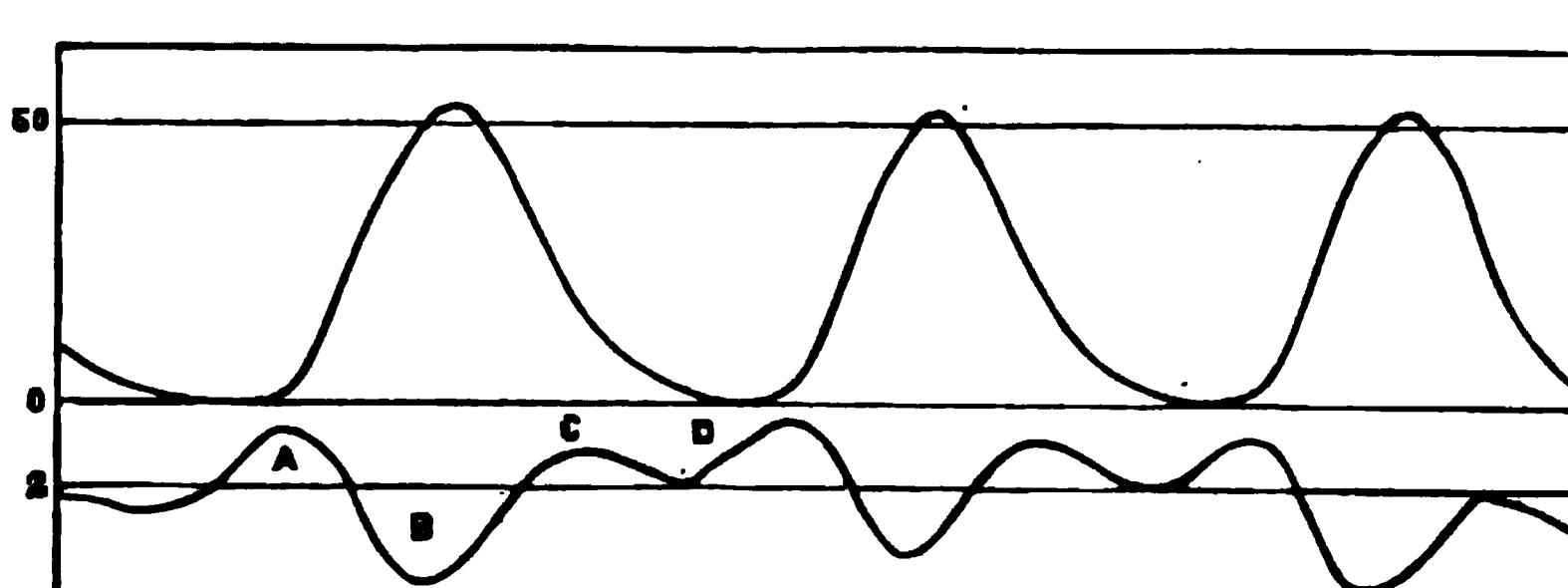
V. Frey and Krehl³²⁰ have investigated the form of the pulse in the heart and the arteries by means of a new recording apparatus, a full description of which is given in the paper. When this apparatus was connected with the ventricular cavity by means of a tube passed through the jugular vein on the right side and the carotid artery on the left, the ventricular contraction gave a curve such as is shown in the illustration. This curve is very different from that obtained from the horse by Chauveau and Marey,—the curve so frequently reproduced in the textbooks. The difference is most marked at the summits of the curves. That obtained by Frey and Krehl shows none of the maintenance of contraction which is so characteristic of the curve given by Chauveau and Marey. On the contrary, the relaxation of the ventricle follows quickly upon the contraction. The authors think that the curve with flattened summit is a result of

the position of the canula in the ventricle. Unless the opening of the canula lies near the base of the ventricle it will be occluded by the contracting muscle, and thus bring about the flat-topped curve. They were able easily to obtain curves of this kind by altering the position of the canula in the ventricle. The normal curve of contraction obtained by them shows also a



CURVE FROM LEFT VENTRICLE (CLOSED THORAX). (V. FREY AND KREHL.)
(Archiv f. Anat. u. Physiol.)

fall below the base line, at the end of diastole; that is, a negative pressure. The authors account for this by ascribing it to the suction action of the ventricles, owing presumably to an active elastic expansion. Under certain conditions—for instance, rapid pulse or overfilled veins from massage of the abdomen—this negative pressure was not found in the curve, the heart filling up too



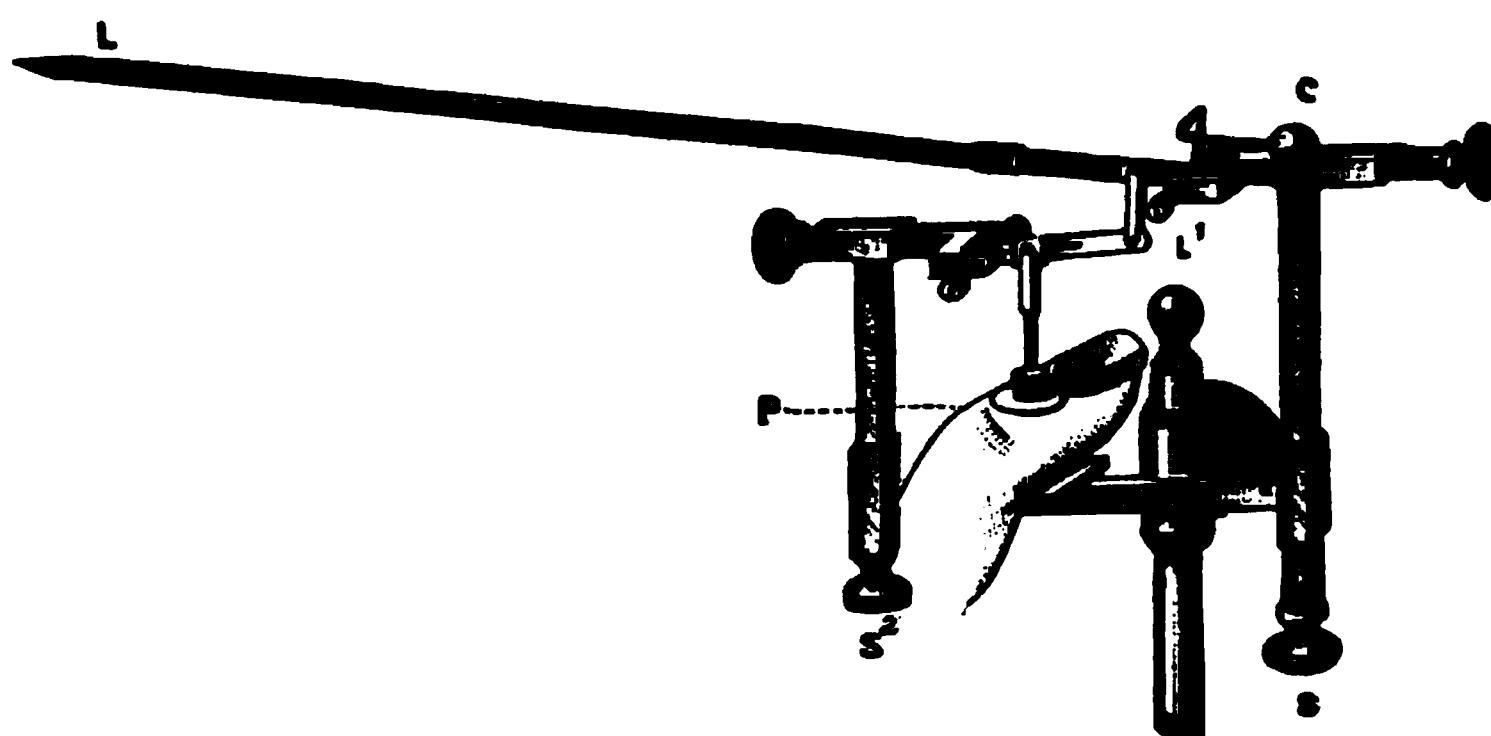
SIMULTANEOUS TRACING FROM THE RIGHT VENTRICLE AND THE RIGHT AURICLE. (V. FREY AND KREHL.)
(Archiv f. Anat. u. Physiol.)

rapidly during diastole to permit its development. Their curves undoubtedly show a negative pressure, even in the opened thorax, but their explanation is in opposition to the direct measurements made by Martin and Donaldson (see ANNUAL, 1888) upon the isolated mammalian heart. Simultaneous tracings from both ventricle and auricle give them some interesting results which can

be seen from an inspection of the curves in the accompanying figure. The upper curve is easily understood. It is the typical curve of a ventricular contraction as given by their instrument, except that at the end of diastole no negative pressure is indicated. The auricular curve shows two waves of pressure for each contraction. The first of these (A) precedes the ventricular contraction and may be explained as due to the auricular systole. This is followed by a diastolic expansion (B) showing a marked negative pressure, which is explained by the authors as due to the suction action of the expanding auricles. Granting that the auricles do expand actively and exert a suction action, a point which is certainly far from being generally admitted, the amount of the negative pressure is surprising. It seems questionable to the reviewer whether it is not partially caused at least by the change in position and form of the base of the ventricle, which is at this time, as shown in the tracings, at its maximum of contraction. The second wave of pressure (C) in the auricular curve is explained by them as due to the inrush of blood, the tracing showing that this takes place while the auriculo-ventricular valves are closed. The fall of pressure (D) following immediately upon this wave is caused by the suction action of the expanding ventricles. The closure of the auriculo-ventricular and semilunar valves takes place with such smoothness that no indication of either act is seen upon their curves. The authors therefore doubt the explanation given to the marking in the well-known curve of Chauveau and Marey, which connects it with the closure of the semilunar valves. With reference to the pulse-curve, they believe that the dicrotic wave is not caused by the closure of the semilunar valves. If the act of closure gives rise to a wave on the aorta side it should give some variation in pressure also on the ventricular side; but this does not occur, as shown from their curves and also from those given by Rolleston (see ANNUAL, 1888). They seem to favor the older theory of a reflected wave from the periphery. As some argument for this theory they state that in some arteries, *e.g.*, the carotid and the radial, it appears earlier in the descending limb and also stronger than in other arteries,—the dorsalis pedis, for example. This seems to be explicable only upon the hypothesis that it has a different place of origin from the primary wave. So, upon the theory of a peripheral origin, one might expect varia-

tions in the position and size of those secondary waves such as they obtained.

Making use of a spring manometer, described in a previous paper, Hürthle²⁴⁶,_{v. 7, p. 17} investigates also the origin of the secondary waves of the pulse-curve. He starts out with the supposition that if the secondary waves are of peripheral origin, then their distance from the apex of the primary wave will be shorter the nearer to the capillary area the measurement is made. In the common carotid we have a long stretch of artery reaching from the root of the neck to the base of the skull, i.e., to the origin of the internal carotid, upon which such a measurement may be made. The aorta gives a chance for a similar determination by connecting one manometer with the left carotid at its emergence from the thorax and the other with the crural. He found that in



SPHYGMOGRAPH. (FRANÇOIS FRANCK.)
(Arch. de Phys. Norm. et Path.)

every case the simultaneous tracings from two manometers showed that the secondary waves appear at the same distance from the apex of the primary. Hürthle, therefore, concludes that the secondary waves must originate at the base of the aorta with the primary wave, and that they are propagated in the same direction. Hürthle states that the secondary waves do not necessarily have the same velocity as the primary. The velocity may be greater, presumably in consequence of the heightened arterial pressure during systole, since it has been demonstrated, what might be accepted on *a priori* grounds, that the higher the blood-pressure the greater the velocity of the pulse-wave.

François Franck⁴¹⁰,_{p. 111} describes a very simple sphygmograph, or,

perhaps, more properly, plethysmograph, for registering variations in the volume of the finger due to changes in the blood-supply. The great simplicity of the instrument and the fact that it can be used without inclosing the finger in any liquid suggest that it may find a possible clinical application. The instrument is shown in the accompanying illustration. It consists essentially of two levers arranged so as to magnify greatly small changes in the volume of the finger. The upper lever is counterbalanced, as shown in the figure; the lower lever rests on the back of the last phalanx of the finger, by means of a small disk, which can be properly loaded by the addition of small weights, the position of which is indicated in the illustration. As an example of what the instrument is capable of doing, one of the tracings is reproduced. It shows the effect of stimulation of pain-nerves upon the blood-pressure. The other hand was touched with a thermo-cautery, the stimulation taking place at D. The first effect is an increased flow of blood to the finger, probably because of an increased action of the heart; but this is followed by the slower vasomotor effect, the constriction of the peripheral vessels causing a diminution in volume of the finger. From the tracings given in the paper it seems quite evident that, outside of any clinical use, it may prove a valuable instrument in exploring the vasomotor changes in various parts of the skin under physiological and pathological conditions.

EFFECT OF STIMULATION OF SENSORY NERVES
OF THE SKIN. (FRANÇOIS FRANCÉ.)
(Arch. de Physiol. Norm. et Path.)

It was shown some years ago, by Meltzer, that in man the act of deglutition is accompanied by an increased rapidity of heart-beat; when a series of deglutitions takes place, the effect may be very marked. Wertheimer and Meyer⁴¹⁰ confirm this statement, and give a number of interesting tracings showing the action. But they find that in the dog the effect of swallowing is just the reverse; the heart-rate is slowed, or, in some cases, complete inhibition is produced. Their best results were obtained from animals rather feebly chloralized, or with the spinal cord severed just below the medulla. Simultaneously with the slowing of the pulse, there is a

partial or complete inhibition of the respiratory movements in the expiratory phase, which is found in man, indeed, as well as in the dog. The authors believe that the cause of these associated phenomena is entirely central. The discharges from the deglutition centre in the medulla lead to an inhibition of the respiratory centre, and this in turn stimulates the activity of the cardio-inhibitory centre. The intermediate action of the respiratory centre finds some proof in the fact that if the dogs were made apnæic, deglutition had no effect upon the heart-rate. The authors do not appear to have thoroughly considered the action of sensory stimulation in bringing about the augmentation or inhibition of the respiratory and cardio-inhibitory centres during the act of deglutition. Certainly, with reference to the effect upon the respiratory centre, Marckwald has shown that stimulation of the glosso-pharyngeal nerve, one of the sensory nerves concerned in the swallowing reflex, causes an inhibition of the respiratory movements.

Sewall and Sanford¹⁷⁸ have carried out for the human being some of the vasomotor investigations previously made upon lower animals. Their experiments were made upon the finger or arm while inclosed in a plethysmograph. The skin or the ulnar nerve was stimulated in various ways with induction currents of different rates and intensities, with the continuous galvanic current, with the interrupted and the oscillating galvanic currents. Most of the apparatus described in the paper is new, and shows great ingenuity in its construction. The battery for producing the oscillating galvanic current is especially worthy of notice, and in the hands of the inventors gave more constant results than the other forms of electrical stimulation used. The authors state that rate of current and direction had no distinctive influence upon the resulting vasomotor changes. In this respect their results differ, apparently, from those of Bowditch and Warren, who found that in the frog's legs either vaso-dilatation or vaso-constriction may be obtained, according to the rate of stimulation. The intensity of the stimulus, on the other hand, was of the greatest importance in determining the effects produced. Strong stimulation caused pronounced and long-continued contraction of the blood-vessels, while weak or moderately strong stimulation was followed, after an initial, temporary contraction, by vascular dilatation. The vaso-dilatation occurred more frequently, both as a direct and as an after effect of

stimulation, when the ulnar nerve was excited than in the case of stimulation of the fingers. In the latter case it is possible that only the vasomotor mechanism of the skin was involved, which would serve to explain the difference. They explain their results in all cases as due to reflex, not to direct, stimulation of the vasomotor fibres. They give a number of reasons for this interpretation. For example, from this point of view it is easy to explain why varying rates of stimulation made no difference in the vasomotor effects. If the action was reflex, the motor discharges, according to our usual conception of the action of nerve-centres, were probably uniform, no matter what the rhythm of the afferent impulses was.

The law of Bell, as originally stated, applied only to motor and sensory nerve-fibres in a restricted sense. It is, perhaps, generally believed that the separation of the fibres in the two roots of the spinal nerves might be extended to all afferent and efferent fibres.

Morat and Dastre have previously shown that the vaso-dilator fibres of the cervical sympathetic, destined for the bucco-facial region, arise from the cord with the second, third, fourth, and fifth dorsal spinal nerves, and emerge from the cord in the anterior roots of these nerves.

In a new paper Morat⁴¹⁰ makes similar experiments upon the nervi erigentes. He finds that they also leave the cord in the anterior roots of the sacral spinal nerves. Morat does not seem to know that similar experiments, with the same results, have been published previously by Gaskell. (See ANNUAL, 1888.) Mall makes a short communication of great interest. He shows that in the portal vein, at least, there are distinct vasomotor nerves. His proof is as follows: If the aorta is ligated high up at the origin of the left subclavian, and then the splanchnic nerve is stimulated, the portal vein may be seen to contract even to the complete disappearance of its lumen. This could not have been a secondary result of changes in circulation in the abdominal viscera, since the circulation through these viscera had been completely interrupted by the ligature round the aorta. If, after ligating the aorta, the carotid is connected with a manometer, stimulation of the splanchnics will cause a rise of arterial pressure. The only explanation is that the stimulation of the splanchnics causes a contraction of the veins of the mesentery and of the

liver (?). By reference to the paper of Roy and Sherrington (see "Central Nervous System") it will be seen that they have made a similar discovery for the jugular and the veins of the head. Mall promises to pursue his work still further. It seems that a vaso-motor mechanism for the veins is about to be worked out, which will add another factor to the already complex vasomotor mechanism, and will doubtless clear up many facts not now understood.

RESPIRATION.

Sandman⁸²⁰ reports some new experiments upon the musculature of the bronchi and the relation of the vagus nerve to it. Animals were curarized and kept alive by artificial respiration. At a given moment artificial respiration was stopped and connections made between the trachea and a recording tambour. The lever of the tambour rose steadily for some time, which the author explained as due to a slow elastic recoil of the lungs themselves, inasmuch as the same result could be obtained from a dead animal. Stimulation of the peripheral end of the vagus caused either a sudden rise or fall in the lever; that is, a contraction or dilatation of the lungs. The author thinks that both of these effects arose from an action on the bronchial muscles. Action upon the heart could not have had any part in the result, since the same effect was obtained after the administration of atropine. As both contraction and relaxation of the lungs were obtained, it would appear that both exciting or motor and inhibitory fibres are distributed by the vagus to the bronchial musculature. Reflex effects could be obtained easily from stimulation, mechanical or chemical, of the nasal or laryngeal mucous membranes. The protection of the air-passages is thus made more complete. Irritation of the mucous membrane of the nose will lead not only to sneezing, but also to a contraction of the bronchi throughout the lungs. So, stimulation of the laryngeal membrane will cause both coughing and bronchial contraction.

Sewall and Pollard¹⁷⁸ call attention to the importance of the complementary respiratory movements of the diaphragm and the ribs. This relation is illustrated most forcibly in phonation, especially in singing. They took simultaneous tracings from three pneumographs placed, one upon the abdomen, one over the sternum at the level of the eighth rib, and one over the sternum

at the level of the fourth rib. They were able to prove in this way that in rapid singing of the scale, the driving force, as the pitch rises, is chiefly from the contractions of the abdominal muscles; nevertheless, at the same time, there is an expansion of the chest. On the other hand, in going down the scale, the chest contracts while the abdomen is protruded, as in inspiration. The significance of these complementary movements seems to lie in the fact that the resonance character of the chest is thereby altered to suit the rise or fall in pitch. Increase in the transverse diameter of the thorax and decrease in its vertical diameter elevate the pitch, and the reverse changes lower it. The experiments emphasize a new fact of immediate importance to teachers of singing and elocution, one that should form part of a basis for the scientific cultivation of the voice. These antagonistic movements seem to come into play in many of the modified respiratory movements, such as laughing, yawning, etc. The authors believe that in such cases they serve a useful physical purpose by kneading the air in the lungs. As in holding one's breath, if respiratory movements are made with closed glottis, the suspension of respiration can be borne for a longer time, because of the more complete mixture of the pulmonary air thereby produced.

The periodic increase and decrease in the respiratory movements, known to clinicians as the Cheyne-Stokes respiration, is a semi-physiological phenomenon, since periodic breathing, closely resembling it at all events, is known to occur in sleep, in hibernation, in animals under chloral, etc.

Wertheimer,⁴¹⁰ in a new paper, shows that it is not necessarily a phenomenon limited to changes going on in the respiratory centre of the medulla. He cuts the medulla below the centre, and, after keeping the animal alive for awhile by means of artificial respiration, spontaneous respiratory movements will again appear from the independent activity of the spinal centres. If now artificial respiration is suspended, the spinal respiratory movements may show a distinctly periodic grouping. He infers, therefore, that the functional disturbance which brings on the Cheyne-Stokes breathing may affect the whole cord as well as the medulla. As for the cause of the periodicity, he attributes it to a diminution of irritability of the respiratory centres, which may be induced by troubles of nutrition in the nerve-centres from an insufficient

supply of blood, or from blood vitiated by toxic substances, as in infectious diseases; or may arise from partial inhibition of the centres, either through the sensory nerves connected with them, or from some direct action.

Though still a subject of investigation, it is, perhaps, generally admitted that the vagus contains two sets of afferent fibres from the lungs, one inspiratory and one expiratory or inhibitory. According to the self-regulating theory of Hering-Breuer the inhibitory fibres are stimulated by an expansion of the lungs and the inspiratory fibres by a collapse, so that in this way the normal rhythm of respiration is automatically maintained. It is a little difficult to conceive how the collapse of the lungs should act as a stimulus to the inspiratory fibres. Meltzer¹¹¹ proposes an ingenious theory which obviates this difficulty. He proves, experimentally, that strong stimulation of the vagus always inhibits the respirations, but that after the cessation of the stimulus there is a distinct inspiratory after-effect. He explains this by supposing that the stimulation affects simultaneously the two sets of fibres, but that the inspiratory fibres show a long after-effect to stimulation. So that the first result will be the effect upon the inhibitory fibres, and later the effect upon the inspiratory fibres makes itself felt. We may suppose that this takes place also under normal conditions. Expansion of the lungs stimulates mechanically both sets of fibres; the inhibitory fibres are acted upon more strongly and the immediate effect is an expiration, but during this expiration the action of the inspiratory fibres comes out and brings on a new inspiration. The author illustrates his idea by comparison with the well-known effect of stimulating simultaneously the accelerator and inhibitory fibres of the heart. In this case the immediate effect is inhibition, but as this passes off the acceleration becomes apparent owing to the long after-action of this set of fibres.

From a long series of experiments made upon dogs, in which the quantities of CO₂ exhaled within a certain considerable period of time were estimated, Richet¹¹⁰ proves that the oxidations of the body, in animals of the same species, vary inversely with the weight. The oxidations are reduced, of course, to a unit of weight and time. For instance, to take his extreme figures, a dog weighing 24 kilogrammes burned per kilogramme and per hour 1.026 grammes (16 grains) CO₂, while a dog weighing 2.35 kilogrammes

burned 2.265 grammes (35 grains) CO_2 per hour for each kilogramme of weight. On the other hand, the production of CO_2 is directly proportional to the extent of integumentary surface. In making his calculations of the skin area he adopted the formula of Meek, namely, $S = K \sqrt[3]{P^2}$, in which S = the surface, K is a constant equal to 11.2 for dogs, and P = the weight of the animal. Both of these generalizations of Richet have been current in physiology for some time, though his proofs are more satisfactory than those hitherto offered.

The recent discussion in this country between Donaldson and Hooper (see ANNUAL, 1888) with reference to the action of the recurrent nerve upon the glottis is taken up by Livon.⁴¹⁰ His work tends to confirm the position ultimately taken by Hooper; that is, he finds that whether one gets abduction or adduction depends more upon the rhythm or rapidity of stimulation than upon variations in the strength of the stimulus. With medium or feeble currents abduction is produced by a slow rhythm of stimulation. Adduction comes out in all cases as a result of rapid stimulation, and when the current is strong will ensue even with a slow rhythm of stimulation. One of the most important contributions to our knowledge of the innervation of the laryngeal muscles is found in a recent paper by Semon and Horsley.⁴² The authors show that for the movements of the glottis a cortical centre can be localized only for the adduction; that is, the movement especially belonging to phonation. The abduction movement, which may be regarded as chiefly of respiratory importance, seems to have its nerve-centre in the medulla, since stimulation of the accessory nucleus will give abduction in all cases. The cortical centre for the adduction fibres lies (in the ape) behind the lower end of the sulcus præcentralis, at the base of the third frontal convolution. Stimulation of this area in either hemisphere gave a double-sided action upon the glottis, while extirpation of the centre in either hemisphere caused no paralysis. So that the adductor muscles of the glottis can be controlled perfectly by either centre alone. The authors make some clinical deductions from their work. Semon believes that the spasm in laryngismus stridulus may result from an affection of only one of the cortical centres, or of both. So the cry which ushers in an epileptic seizure is probably not due to any immediate action on the medulla, as is

usually supposed, but rather constitutes one phase of the cortical excitation.

DIGESTION.

Lea¹⁷⁸ has devised a simple apparatus for artificial digestion, the idea of which is to imitate as nearly as possible the conditions of natural digestion in at least two points, namely, active movement of the digesting mass, and removal of the end products of digestion as they are formed. A third characteristic of natural digestion, the continual supply of new digesting liquid, he was not able to imitate. With this apparatus he studied first the action of saliva on starch. He states that the action of the saliva was more rapid and the conversion of the starch was more complete than is the case with artificial digestion as usually conducted. He is inclined to believe that under normal conditions in the body all of the starch is changed into maltose, the usual belief, of course, being that the starch is converted partly to maltose, partly to a form of dextrin. His experiments upon pancreatic digestion lead him to think, against his previous beliefs, that the formation of leucin and tyrosin is a normal result of pancreatic digestion. He is not prepared to give any explanation of the further fate of these substances.

Popoff⁸³ makes experiments upon the rapidity of digestion of beef and fish, both in a raw state and after various methods of culinary treatment. In his work he used an artificial gastric juice. The material under investigation was left in the digesting mixture for three to five hours, and then the amounts of albumen, digested and undigested, were carefully determined. Like recent observers who have made similar experiments, he finds that both the beef and the fish are digested more easily—that is, more quickly—when raw than when cooked. The more the meat is cooked, the more difficult the digestion becomes, and this is especially true for the beef.

With reference to the relative digestibility of beef and fish, he finds beef the more digestible of the two, though smoked fish forms an exception to this rule, being more easily digested than smoked beef. Smoked fish, in fact, seems to be the most digestible form of fish; it is acted upon by the digestive mixture more rapidly than even the raw fish. A general idea of his results is easily obtained from the following table, which is arranged with reference to the digestibility of raw beef as a standard:—

Beef, raw, digestibility,	100.0 per cent.
“ cooked, digestibility,	90.3 “
“ smoked, digestibility,	71.0 “
“ smoked and cooked, digestibility,	60.6 “
Eel, raw, digestibility,	74.2 “
“ cooked, digestibility,	69.7 “
“ smoked, digestibility,	94.2 “
“ smoked and cooked, digestibility,	91.0 “
Plaice (Scholle), raw, digestibility,	69.7 “
“ cooked, digestibility,	65.8 “
“ smoked, digestibility,	111.6 “

Neumeister ³⁹¹ _{v.n.p.m.} reviews in a very interesting way some of the unexplained, though significant, facts relating to the absorption and assimilation of the albumens. He dwells upon the fact that certain albumens, introduced directly into the blood, are not assimilated by the tissues, but are eliminated through the kidneys. To this group belong the peptones and albumoses, whether produced by natural or by artificial digestion, egg-albumen, haemoglobin, and casein. On the other hand, some of the simple proteids injected directly into the blood are utilized by the tissues; at least, they do not appear in the urine. Serum-albumen, as has long been known, belongs to this group. But Neumeister finds that syntoin from various sources albuminates from egg-albumen, and even crystallized phytovitellin from pumpkin-seeds may be included in the same class. The non-absorption of peptones or albumoses from the stomach or intestines into the blood is becoming an accepted belief; it is, probably, generally thought that during absorption they suffer a change into some other form of proteid.

Salvioli and Hoffmeister have asserted this upon experimental grounds. Neumeister gives a simple experiment, which appears to prove the same point. A solution of peptone in defibrinated blood was brought in contact with the intestines of a rabbit. The intestines had been thoroughly cleaned and cut into small pieces. If the mixture was kept at the body temperature, the peptone disappeared within a short time. Rather a curious result was that rabbits' liver, cut into small pieces and mixed with peptonized blood, will cause the peptone to disappear, as in the case of the small intestine, while dogs' liver showed no such action. With reference to the very important question whether the altered peptone is converted into an albumen which becomes a part of the blood and serves directly as a source of nutrition to the tissues, or

whether it is broken up at once in the intestines into leucin, tyrosin, tryptophan, or similar bodies, Neumeister is unable to give any satisfactory answer. Seegen's well-known view (see ANNUAL, 1888), that peptone gives rise to sugar in the liver as one of the products of its destruction in that organ, without the intermediate production of glycogen, is severely criticized by Neumeister. He repeats some of Seegen's experiments, but fails to obtain the same result. Neumeister describes in the hen's egg a new albumen, to which he gives the name of pseudopeptone, since, while it closely resembles the peptones in some characteristic properties, it differs from them in others. For example: it is soluble in water, and is not precipitated by nitric acid, nor by acetic acid and potassium ferrocyanide; yet it is not dialyzable, and is precipitated by saturation with ammonium sulphate.

Arthus and Pagès⁴¹⁰ repeat a number of experiments formerly made by Hammarsten in his well-known investigation of the rennet ferment, with the exception that they use ordinary milk, while Hammarsten used pure casein. Their work corroborates that of Hammarsten, proving that in the coagulation of milk by rennin there are two distinct steps,—first, a chemical transformation of the casein, and, second, the coagulation or precipitation of this modified casein. The chemical transformation of the casein is owing to the action of the ferment, and the reaction is accelerated by weak acids, such as CO_2 , and by the salts of the alkaline earths; while it is retarded or prevented by cold, by alkalies, and the alkaline carbonates. The substance or substances formed from the casein by the ferment are not precipitated by the further action of the ferment, but may be coagulated by heat or by the presence of the lime salts. The actual precipitation or curdling, then, under normal conditions, is probably brought about by the action of the lime salts in the milk. If these salts are removed, then the curdling does not take place, although the ferment is still able to exert its specific action upon the casein. As the authors point out, the action of the rennin is fairly comparable to that of the proteolytic ferments,—pepsin, trypsin, etc. Somewhat similar experiments of the authors upon the clotting of blood are given under that heading.

Recent experiments seem to prove, beyond any reasonable doubt, that one of the chief functions of the bile in the intestines

is to facilitate the absorption of fats. It remains to be explained in what way the presence of the bile aids the passage of the emulsified fat through the epithelium of the villi. The usual explanation is that the bile, being miscible with fats, permits the latter to come into close contact with the epithelial cells. This theory seems to rest mainly upon some old experiments of v. Westinghausen, who found that, in capillary glass tubes moistened with bile, oil will rise higher than in similar tubes moistened with water, and, moreover, that oil will filter more readily through a membrane which has been moistened with bile. Gröper⁸²⁰ Physiol. Abth., p. 505, 1889 has taken the trouble to repeat these experiments, apparently in a very careful way. He finds that the old results are erroneous; that the presence of bile makes no difference in the ease with which oils rise in capillary tubes or filter through porous membranes. We must look elsewhere, then, for an explanation of the influence of bile on the absorption of fats. Dastre⁴¹⁰ p. 215 gives in detail a number of observations upon the effect of bile upon digestion and fat absorption which have already been noticed in the ANNUAL for 1889. Briefly stated, his experiments gave him the following results: With reference to the effect of the bile upon gastric digestion, he found that the introduction of large quantities of ox-gall into the stomach of a dog during digestion had no apparent effect. He next made a gastric fistula in a dog, and introduced directly into the stomach both ox-bile and dog-bile, but could not see that the digestion was in the least interfered with. Taken with recent experiments of Oddi, quoted by Dastre, in which the bile was conducted immediately into the stomach by a fistula, the results seem to show that the presence of bile does not cause vomiting or gastric trouble of any kind, nor impede the action of the gastric juice. The experiments bearing upon the influence of the bile upon the absorption of the fats have already been fully presented in the ANNUAL of 1889.

V. Walther⁸²⁰ Physiol. Abth., p. 509 confirms the important observation made by Munk with reference to the absorption of ingested fatty acids. Munk's statement was that the fatty acids are absorbed as neutral fats. V. Walther analyzed the stomach and intestines after a known diet of fatty acids. His analyses corroborate the general fact, and seem to show that the conversion to neutral fat takes place in the small intestine; but in what way he is unable to

explain. If, eight hours after a meal of a known quantity of fatty acids, analyses were made of the stomach and intestines, it was found that a much larger quantity had been absorbed than could be accounted for by that carried off through the thoracic duct; but he was not able to explain by what other route absorption had taken place.

Paton¹⁷⁸ v.11,p.100 reports a case of removal of a large sarcoma from the posterior triangle of the neck, which was followed by the establishment of a permanent fistula of the thoracic duct. From data which are not completely satisfactory he estimates that the rate of flow in the thoracic duct is between 3 and $4\frac{1}{2}$ litres (3 and $4\frac{1}{2}$ quarts) in twenty-four hours for a man weighing about 60 kilos. Analyses of the lymph made at four different times showed that the total proteids varied from 11.8 to 13.7 parts in a thousand, whereas previous analyses have placed the proportion as high as 36.6 to 73.8 parts per thousand. The lymph coagulated easily in all cases.

The movements and innervation of the intestines have been studied by Bechterew and Mislawsky.³²⁰ Supplement Read p. 262, '95. The contractions of the intestines were recorded by means of a small balloon attached to a glass tube, which was introduced into the intestines at one or more points. The balloon and tube were filled with warm water and connected by tubing with a registering apparatus. Usually two such records were taken simultaneously, one from the small and one from the large intestines. They state that the peristaltic waves which pass along the small intestine do not terminate at the ileo-cæcal valves, as is usually taught, but may continue without interruption to the musculature of the large intestine. The normal tonicity of the intestinal wall persists after section of all extrinsic nervous connections, and therefore may be considered as dependent upon the intrinsic ganglia; peristalsis and rhythmic contractions are also possible after section of the extrinsic connections. With reference to the action of the splanchnics and vagi upon the intestinal movements, they find, as others have done, that the splanchnics are chiefly inhibitory, though they state that in some cases stimulation of these nerves was followed by contractions, indicating that in some cases they may carry viscero-motor nerve-fibres. The vagi are usually regarded as the motor nerves of the intestines; the authors think, however, that they contain

both motor and inhibitory fibres, since their stimulation calls out rhythmical contractions; and rhythmical movements, according to their conception, imply both inhibition and excitation. Stimulation of the cortex of the cerebrum in the sigmoidal convolution and neighboring areas (the experiments were made upon dogs) gave them both contractions and inhibition of the small and large intestines. Whence they concluded that motor and inhibitory centres for the intestines are present in the cortex. Subordinate centres with the same actions were found in the optic thalami, since after removing a portion of the hemisphere direct excitation of the thalamus gave them results similar to those obtained from stimulation of the cortex. These centres are connected with the intestines through the vagi and splanchnics. The splanchnic fibres which supply the small intestine leave the spinal cord in the sixth to the thirteenth dorsal and first lumbar spinal nerves, while those for the large intestine pass out in the sixth and seventh lumbar and first, second, and third sacral nerves.

SECRETION.

From dissection and histological examination Langley¹⁷⁸ is convinced that the so-called submaxillary ganglion lying in the angle made by the chorda tympani and the lingual has no connection with the fibres going to the submaxillary gland, but is intercalated on the course of those going to the sublingual. So that it would be more accurate to speak of it as the sublingual gland. The physiological importance of this gland is well known. (See article by Wertheimer, under the head of "Nervous System.") In the triangle inclosed by the chorda, lingual, and duct of Wharton there seem to be a number of nerve-cells, the so-called submaxillary ganglion being a special collection of them, all of which belong physiologically and histologically to the sublingual gland. The chorda fibres which enter these cells are medullated; those which leave them to pass to the gland are non-medullated. Langley gives a physiological proof of a new kind for this relation of the nerve-cells to the sublingual. In former experiments he has shown that nicotine applied locally has the peculiar property of paralyzing the nerve-cells, but has no action upon the efferent fibres from these cells to the gland. If the chorda-lingual triangle is brushed over with a 1-per-cent. solution of nicotine, stimulation

of the chorda or of the lingual fails to produce a secretion of the sublingual, while the submaxillary secretes as under normal conditions. On the other hand, direct stimulation of the sublingual will cause it to secrete. Accepting his premises, this would prove that the nerve-cells in the triangle belong to the sublingual gland. It is to be supposed that the submaxillary gland is also supplied with nerve-cells in which the chorda fibres end before distribution in the gland, but these cells must be contained in the hilus of the gland. With reference to the sympathetic fibres going to the submaxillary ganglion, he concludes that they end in the nerve-cells of the superior cervical ganglion, but after leaving this ganglion they pass directly to the secretory gland-cells, without ending in the intrinsic ganglia. His reasons for this belief are as follow: A dose of nicotine injected into the veins of a cat or rabbit will prevent stimulation of the cervical sympathetic nerve from having any effect upon the gland secretion, while direct stimulation of the upper ganglion or its efferent branches will give the usual secretion. The force of the argument depends upon the value of his generalization with reference to the peculiar action of nicotine upon nerve-cells. By a similar series of experiments he demonstrates that the sympathetic secretory fibres, after emerging from the cord and entering the sympathetic chain, do not make connections with the nerve-cells until they reach the superior ganglion. The chorda tympani contains also vaso-dilator fibres for the submaxillary gland. Injection of nicotine paralyzes these fibres as well as the secretory fibres when the chorda itself is stimulated; but if the stimulus is applied to the hilus of the gland, where the intrinsic ganglia are placed, both secretion and vaso-dilatation will be obtained. Following the argument used by the author, this proves that the vaso-dilator fibres also end in the intrinsic ganglia before distribution to the vessels.

Arloing⁴¹⁰ gives an account of experiments made upon the secretory fibres of the sympathetic distributed to the lachrymal gland and the glands of the nostrils. His experiments were made upon the ox. He holds that the sympathetic supplies these glands with inhibitory as well as secretory fibres. The presence of the latter may be demonstrated by actual stimulation. His reasons for supposing that inhibitory fibres are also present seem to be based mainly upon experiments made with pilocarpine. After section of

the sympathetic in the upper part of the neck the secretory fibres lose their irritability entirely, after a certain period. (According to Bradford, ANNUAL, 1889, this occurs only as far as the superior cervical ganglion for the fibres of the submaxillary gland.) If, now, pilocarpine is injected, it will cause a more copious secretion on the side on which the nerve was cut than on the other. This finds its easiest explanation to the author in the hypothesis that normally inhibitory fibres are present, and after their destruction the pilocarpine has a chance to affect the gland more powerfully than under normal conditions. The argument does not seem to be conclusive. Arloing's theory is practically the same as that used by Bradford (ANNUAL, 1889) to explain the paralytic salivary secretion, with the exception that Bradford finds inhibitory (anabolic) fibres only in the cerebral nerves. Arloing extends the hypothesis of inhibitory fibres to the lachrymal gland, from the results of similar experiments made upon it.

Beal²⁴⁶ _{v.47, p.118} has repeated the old experiments of V. Wittich upon the secretion of uric acid by the kidney of the bird. According to V. Wittich, examination of the kidney, either in freshly teased specimens or in sections of the hardened tissue, shows the urates as irregular, roundish, yellow granules, lying in the lumen of the tube, and also in the epithelial cells lining the tube. The latter point is of special theoretical significance, both as undoubted evidence of the active participation of the cells in the act of secretion, and as some indication that the function of the cells is simply eliminative. Beal had no difficulty in finding the granules in the lumen of the tubes, but in no case could he discover any of them in the cells themselves. He records also a number of interesting observations upon the kidney of the mollusks. The secreted substance in them is guanin, and it may be found in the epithelial cells. He gives also some reasons for believing that in this case the guanin is formed in the cells. To test an assertion of Genth that the uric acid of the urine diminishes in proportion to the water drunk, and may even be made to disappear in this way, Schöndorff²⁴⁶ _{v.44, p.520} has repeated his experiments, making use of a better method for the determination of the uric acid. He finds that the ingestion of water exercises no influence on the amount of uric acid, though it seems to cause a distinct increase in the total nitrogen excreted.

Arthaud and Butte⁴¹⁰ find that stimulation of the vagus in the neck or below the origin of the cardiac fibres either slows or stops completely the secretion of the urine, according to the strength of the stimulation. The effect is not due to a direct inhibition of the secretion, but is vaso-motor, since observations made upon the kidney circulation at the same time proved that there was a greatly diminished flow of blood from the renal vein during stimulation. Their experiments amount to a demonstration of the existence of vaso-constrictor fibres in the vagus distributed to the kidneys.

NUTRITION AND HEAT REGULATION.

Making use of the Kjeldahl-Wilfarth method for determining the nitrogen, Argutinsky²⁴⁸ endeavors to estimate the total quantity of nitrogen which may be eliminated in the sweat under different conditions. By means of vapor baths he caused a profuse sweating, so that he was able to collect 225 cubic centimetres in one case and 330 cubic centimetres in another. The total nitrogen in the first case amounted to 0.2475 gramme (3½ grains), of which 68.5 per cent. was present in the form of urea; in the second case, to 0.2555 gramme (4 grains), of which 74.9 per cent. was in the form of urea. In a second set of experiments sweating was produced by muscular exertion,—a long walk and mountain climb. It was absorbed by a flannel suit made of a special material, and was collected at the end of the walk. In one experiment he got a total of 759.5 milligrammes (12 grains) of nitrogen, and in another 667.2 milligrammes (10½ grains). The results indicate that during active muscular exertion the amount of nitrogen lost through the skin is not insignificant and should be taken into account in all complete determinations. The same author²⁴⁸ has a second paper upon the effect of muscular exertion upon the amount of nitrogen eliminated in the urine. It was generally supposed that this question had been decided in the negative by the careful work of Voit, Pettenkofer and Voit, Parkes, and others. Argutinsky claims to make use of better analytical methods, and arrives at the result that muscular exercise does increase the nitrogen in the urine. The muscular work consisted in long walks and mountain climbing, and the nitrogen determinations were made by the Kjeldahl-Wilfarth method. No effort was made to keep in exact nitrogen equilibrium, though the diet was kept as regular as possible. He

found that the muscular work caused an increase in the elimination of nitrogen which extended over three days, the maximum in the increase falling sometimes in the first day, sometimes in the last two. If the total amount of albumen oxidized in the body was estimated from the nitrogen eliminated, it was found to account for 75 or 100 per cent. of the total energy expended in doing the muscular work, thus contradicting the famous experiment of Fick and Wislicenus. Argutinsky's analyses are supplemented by some work of Bleibtreu,²⁴⁶ v. 14, p. 201 done in the same laboratory. He determined, in the case of Argutinsky, the proportion of the increase in nitrogen which appeared in the form of urea. He found that the rise and fall in the amount of urea in the urine followed exactly the rise and fall in the total nitrogen. In a third contribution from the same laboratory, by Krummacher,²⁴⁶ v. 17, p. 44 similar experiments were made with the exception that the body was kept in nitrogenous equilibrium over a period of fourteen days, during three of which strong muscular exertion was made by taking long tramps. He found that the muscular work increased the total amount of nitrogen eliminated in one case from 16.845 grammes (4 drachms 19 grains) per day to 18.287 grammes (4 drachms 42 grains); in another case, from 16.305 grammes (4 drachms 11 grains) to 17.9979 grammes (4 drachms 38 grains). The additional oxidation of proteid in the first instance was estimated to cover 64.4 per cent. of the work done; in the second, only 48 per cent. Krummacher lost weight during the experiment. Hirschfeld,²⁰ v. 11 in a paper upon the same general subject, asserts that increased muscular exercise does not affect the nitrogen eliminated, unless the supply of food is insufficient to keep the body from losing weight. Increased muscular work and insufficient nourishment will lead to an increase in the proteid destruction in the body; but increased work with an abundant supply of food will keep the work from affecting the proteid metabolisms. It is possible that the work of the Bonn laboratory is explained by these results of Hirschfeld, though it is apparent that more experiments must be made before this problem reaches its final solution.

Reichert,¹¹² v. 14, A. p. records a large series of calorimetric observations made upon dogs to determine the normal variations in heat production and the relations of heat production to body weight. As the result of his experiments he lays very strong emphasis on the

fact that the body temperature gives no direct indication of the heat production in the body. His observations seem to prove that the body temperature may remain the same through wide fluctuations in heat production and dissipation. The daily records failed to give any definite diurnal rhythm in the heat production and loss, though changes in these factors of an irregular character were observed. In opposition to the general belief and the recent experiments of Richet (see "Respiration"), Reichert finds that the production of heat per kilogramme of animal does not vary inversely with the size of the animal; on the contrary, his figures indicate that combustion is proportional to the size. For animals of the same weight, and, as far as possible, under the same conditions, the heat production for a unit of weight was found to show individual differences, or, in other words, each animal has a specific heat co-efficient. In a communication to the Physiological Society of Berlin, Loewy²²⁰ gives an account of experiments made upon 16 persons to determine the effect upon heat production resulting from cooling the body. The cooling was accomplished by baths, by sprinkling the skin with water, with alcohol, etc. In about half of the experiments there was an increase in the consumption of oxygen and the elimination of CO₂, proving, therefore, that greater heat production had taken place; in other persons there was either no change in the gaseous exchanges or else a diminution. In the first set, where increased heat production was apparent, shivering or muscular movements of some character were visible. He infers, therefore, that in those individuals in whom external cold leads to greater oxidations, the effect is a reflex, consisting mainly in a greater innervation of the muscles. Apparently this reflex is less perfect in man than in some of the lower animals; guinea-pigs, for instance, may be kept for hours in an ice-chamber, without any alteration in the body temperature.

Berthelot²⁰⁸ points out that the union of oxygen with haemoglobin is attended with an evolution of heat. His measurements show that about 14.77 calories are produced for each 32 grammes (1 ounce 14 grains) of oxygen combined. It is probable that in the lungs this production of heat about counterbalances that lost from the blood in warming the expired air and in evaporating water, so that the blood flowing from the lungs has the same temperature practically as that flowing to them.

In the same general series of calorimetric experiments mentioned, Reichert⁸⁰, Feb. 15 made a number with the purpose of determining the effect of alcohol. The animal was placed in the calorimeter for an hour, and a record made from which his heat production and loss for that time were calculated. Alcohol was then given, either through the stomach or hypodermically, and measurements were made of the heat factors and rectal temperatures for the succeeding five hours. The results were irregular, but, taken as a whole, seemed to show that heat production is not materially changed by the alcohol, while the dissipation of heat is increased. The result in that case, of course, is a fall of temperature, which, in his experiments, varied from 0.4° to 2.23° C. (0.72° to 4° F.). The researches of others have shown that the alcohol is used up in the body; that is, it cannot be recovered in the excretions, from which we may conclude that it is oxidized in the body. Moreover, there seems to be a general agreement that the oxygen absorbed and the CO₂ eliminated during such experiments are not materially changed. If the alcohol is oxidized and gives the heat to the body, and if during this period there is no perceptible increase in heat production, then it would appear that the alcohol plays the part of a genuine food, and by its oxidation protects the materials of the body from consumption.

Munk²⁴⁶, v. 44, p. 20 finds that when glycerin is injected directly into the veins of an animal in the proportion of 1 gramme ($15\frac{1}{2}$ grains) to each kilogramme of body weight, there is evidence, from the study of the gaseous exchanges, that the glycerin is oxidized in the body and helps to protect the body fat. On the other hand, the fatty acids, especially the fixed acids, are equal in value to the corresponding amounts of neutral fats of the food in protecting the body fat from oxidation. In fact, they may be used along with nitrogenous foods in maintaining nitrogen and carbon equilibrium in place of the equivalent quantities of neutral fat.

MISCELLANEOUS.

Langendorff⁸²⁰, Physiol. Ann., p. 219, '90 contributes a histological study of the thyroids. Like Biondi (see ANNUAL, 1889), he calls especial attention to the large lymph-spaces outside of the follicles, and to the fact that they are filled with the same colloidal material which is present in the interior of the follicles. Langendorff adds, further,

a new histological point of importance. He finds that the epithelial cells lining the follicles are of two kinds. First, the large cuboidal cells usually described, to which he gives the name of chief cells. Second, a cell present in many, but not necessarily in all, of the follicles, which is sometimes like the chief cell in form, but is sometimes much smaller. Its chief characteristic, however, is that it stains differently from the chief cell when differential stains are employed. To these he gives the name of colloidal cells; they are supposed to make the colloidal substance. He finds intermediate stages between the two forms of cells, and thus explains the histological mechanism of the secretion. Whether the colloidal cells go to ground in making the secretion or whether they are regenerated he was unable to decide. Like Biondi, he believes that the secretion escapes from the follicles directly into the lymph-channels, the escape taking place by rupture of the wall owing to the increasing pressure of the secretion. Influenced seemingly by the fact that this colloidal material cannot be found in the lymph or blood, Langendorff supposes that it does not escape from the glands, but is stored up in the lymph-spaces; he speaks of the thyroids, in fact, as storage glands for the removal from the blood of useless or injurious substances. This latter supposition does not seem to be satisfactory, and to most persons would appear unnecessary. If the colloidal material entered the lymph- and blood- streams, it might readily suffer such a change as to be no longer recognizable.

Ewald and Rockwell,²⁴⁶ v. 47, p. 100 report that the extirpation of the thyroids in pigeons is not followed by any noticeable effects.

In an interesting study of ciliary movements, Kraft²⁴⁶, v. 47, p. 100 describes very carefully a number of peculiarities of this form of contraction, dwelling especially upon the direction of the wave. As one looks at a ciliary field, it is easy to see that the direction of the wave movement is apparently opposite to that of the stream which the ciliary contractions set up. This is readily understood to be an optical deception. Both the wave of contraction and of relaxation in any field proceed from above downward, but the slower backward swing of the cilium is more easily seen, or at least the wave of relaxation is more easily seen, and, as the relaxation is completed first in the upper cells, one gets the impression of an upward-running wave. The cilia respond readily to mechanical

stimulation, and from the point acted upon the stimulus spreads rapidly downward, *i.e.*, in the direction of the movement, but much more slowly upward and laterally. One of the most interesting points in the paper is the proof that an inner impulse may be propagated from cell to cell, somewhat similar to the propagation of an impulse from cell to cell of the heart-muscle, or, indeed, to the passage of a nerve-impulse. The proof is this: If, in a given field of cilia a certain spot is cooled down to the point at which contractions cease, while the cilia some distance below are slowly beating, then, if the quiet spot is mechanically stimulated, though the cilia there do not respond, those below after a certain interval begin to beat much more vigorously. The impulse passes much less perfectly in an upward or lateral direction. In electrical stimulation, the stimulus appears to act at each pole independently of the direction of the current.

Nikolski and Dogiel²⁴⁶ publish an account of some experiments upon the action of curare which are of interest in general physiology. The different kinds of curare brought into trade are of different strengths and methods of preparation. The specimens which they made most use of were obtained from Merck u. Schuchardt, and these were not pure, containing lime and phosphoric acid. All kinds of animals, even amœbæ, were found to be sensitive to the action of curare, but there was a marked difference in the susceptibility to this action among the different animals. Curare is not easily absorbed through the external integument, nor through the mucous membranes, and this is particularly marked in the insects. Larvæ which could be kept for months in water containing curare without injury were quickly paralyzed if any of the drug was introduced directly into the blood. One of the most peculiar results of their work is the discovery that the action of curare on the vasomotor centre in dogs and cats is different from what it is in rabbits. In the former it causes a marked fall of pressure, while in the rabbit it has little or no effect on arterial pressure. They find, moreover, that if the curare is injected into a vein, then its paralyzing effect on the diaphragm may come out, while the phrenic nerves are still capable of causing a contraction when directly stimulated. They conclude, therefore, that death from curare is not caused by its effect upon the endings of the phrenic nerve in the diaphragm, but in consequence of a direct

paralyzing action upon the respiratory centre. Another point of interest is that curare dropped into the eyes of birds causes dilatation of the pupil, while atropine has no effect. In the mammal, as is well known, atropine causes dilatation and curare has no effect. This difference in action seems to be dependent upon the difference in structure of the sphincter muscle of the iris. In the mammalia this is composed of plain muscle-cells; in the birds, of striated fibres. The influence of the curare on the nerve-centres which they discovered is especially worthy of notice, as heretofore we have been accustomed to lay stress mainly upon its action on the peripheral tissues, and, indeed, almost exclusively upon the nerve-endings in the motor tissues.

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THERAPEUSIS.

BLADDER, FEMALE, DISEASES (continued).

GANGRENE. When exfoliating sac protrudes from urethra, pass cath. to empty blad. slowly and diagno. from inversion of bladder; then remove sac and wash out with strong antisept. sol., rep. ev. 4 h. till temp. falls bel. 101° F. (38.33° C.), then at longer interv. till lotion returns pure. Constant drainage, if tendency to retention of urine. ii. H-21.

INCONTINENCE. Dilatation of sphincter. Saenger's meth., ii. H-14. Hyperdistension with aseptic sol.—Separate ureth., twist in its long axis, ant. in position (Gersung's op.). From flouting membrane, excise, caut. base. ii. H-15.

PAPILLOMA. Pass finger through ureth., remove growth with finger-nail, ii. H-17. *Ac. hordei*, 1 pt.; *tinct. hyoscyami*, 4 pts.; *infus. buchu*, 12 pts.; mix: give 1 teasp. ev. 3 h. Lavage of blad. with hot ant. sol. *ac. hordei* ev. other day. ii. H-18. Total extirpation of bladder (Pawlik's meth.), ii. H-20.

TUBERCULAR ULCERATION. Thorough curetting through supra-pub. incis.—Dilate urethra, apply sol. *ac. lactic* (5%) to ulcer or inject sol. (1%) into bladder. ii. H-19.

BLADDER, MALE, DISEASES.

CYTOCELE, INGUINAL. Excision; suture; freq. catheterization. iii. E-13.

RUPTURE. If intra-peritoneal, suture, iii. E-10.

STONE. Litholapaxy, iii. E-10. Supra-pubic lithotomy. Supra-pubic and median lithotomy. iii. E-11. Supra-pubic cystotomy; sut. of blad. with chrom. gut. Intra-peritoneal cystotomy. iii. E-12.

TUMORS. If. after knife has opened the way, the finger and eye discov. malign. growth, do not remove. *In papilloma*, supra-pubic remov.—Locate with cystoscope; remove *per rias naturales*. iii. E-12. Hopkin's eurette, Nitze's irrigating-tube, iii. E-10.

BONE, DISEASES.

NECROSIS. Sol. *ac. hydrochlor.* (4%).—*Glycerin*.—If from phaophorus, early resection. iii. H-21. Regen. of bone by blood-clot meth., iii. H-21.

OSTRITIS SICCA. Of foot and ankle: Remove all bones except metatars. of gt. toe; *Peruv. bals.* and glyc. dress. iii. H-13.

OSTEO-ARTHRITIS. Of elbow (tubercular): Subperiost. resection of joint, iii. H-16.

OSTEOMALACIA. Warm baths. Castration in female. Porro's op.—Sol. bicarb., large doses. iii. H-21.

OSTEOMYELITIS. In long bones, early resection, bef. necrosis is complete, should be done rarely, but do late in dis. when osseous has begun, ac. sympt. have subsided, and necrosis is extensive.—In infl. of epiphyseal lines, cut down to seat at once: / in acetab., intra-pelvic incis. paral. to Poupart. lig. iii. H-20. Drain medull. canals of long bones, after amputation, rubber tubes within. iii. H-2. Of femur: Hip-joint amputa., iii. H-3. Hypnotism, v. A-61.

TUBERCULOSIS OF JOINTS. Resection, iii. H-8. Excision. Erosion. iii. H-14. Conservative treat. in young. Arthroectomy.—Hygiene.—In tumor *albus*, make explor. incis.; be guided by path. changes found. iii. H-15. Subperiost. resection. Of foot: Ignipunet., prelim. remov. of astrag., iii. H-16. Of ankle: Resection—igneous arthroectomy.—Removal of astrag.—Excision—éradication. Of tendons: Fungous form, extirpa.: *hygroma*, incise, drain, extirpate, or inject *induf. emulsi*.—*Indol. mirt.* (10%), 3v-x (xx-xx grms.), to lightly fill cavity, without fixation of jnt., ev. 4 wks.—

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BELLADONNA—ATROPINE—Panow, v. B-6; Dyce Duckworth, T. Lauder Brunton, v. A-17; M. W. Leavitt, C. Williams, John V. Shoemaker and John Aulde, J. Ohage, F. W. Richardson, William McGowan, Rose, E. B. Sangree, v. A-18; T. N. Kelynack, James Cantlie, E. R. Axtell, v. A-19. Poisoning by: McGowan, iv. J-24.

BERIBERI (KAK-KE)—Thomas, Giles, Sensino, Fiebig, Mendes, Rebougeon, ii. C-27; Grimm, Miura, Takaki, Azavedo, Eyre, Harada, Putnam, Birge, ii. C-28.

BILE SECRETION, EFFECT OF OIL AND OTHER SUBSTANCES ON—Rosenberg, v. B-55; Durand, v. B-56.

BILHARZIA HEMMATOBIA—Chaker, London Lancet, Bernays, Schede, Brown, i. G-23; Delafield, Pope, Parker, i. G-24; Oliver, Huzza, Toby, i. G-25; Diago, i. G-41; Bayet, Wehlan, Hunt, i. G-42.

BILIRUBIN—G. de Bruin, Bouchard, v. A-19.

BISMUTH—See, iv. A-52; Sir James Simpson, British Pharmacopoeia, v. A-19.

BLADDER, DISEASES—Anomalies: Fischer, i. L-40. Hemorrhage and Retention: Manton, i. L-40. Neuralgia: Monck, Moricourt, i. L-39. Tumors: Guyon, i. L-40.

BLADDER, FEMALE, DISEASES—Calculi: Strange, Powell, Davenport, Magruder, Ranschoff, ii. H-12; Ranschoff, Davenport, Feleki, Payne, ii. H-13. Cystitis: W. C. Galloway, Strong, Abbot, Brun, ii. H-14. Epithelioma: Marsh, Gilbert Barling, Bruce, Clarke, Sonnenburg, Antal, Guyon, ii. H-18. Extirpation, Total: Pawlik, Panas, ii. H-20. Pissure of Neck: Deedes, ii. H-17. Foreign Bodies: Aldibert, ii. H-15; Desnos, Vergely, Ellison, Köhler, ii. H-16; Pamard, Készmárszky, ii. H-17. Gangrene: Haultain, ii. H-19; Sir Spencer Wells, Haultain, ii. H-20. Incontinence Urine: Saenger, ii. H-14; Strong, Ger sunny, Stuart-Nairne, ii. H-15. Instruments: Küstner, Worrall, ii. H-21. Papilloma: Palmer, ii. H-17, 18. Tubercular Ulceration: Battle, ii. H-18; Fenwick, Battle, ii. H-19.

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BLATTA ORIENTALIS—Joseph Drzewiecki, v. A-19.

BLOOD—General Conditions: Kollmann, Scheurlen, ii. E-1; de Renzi, Maragliano, Sciolla, H. von Hösslin, ii. E-2; Oppenheimer, ANNUAL 1890, Arthur Klein, Carl Laker, Rollett, Marshall D. Ewell, ii. E-3; Ubaldo Musci, Frederick Gaertner, von Fleischl, Carl Reichert, Ohlmacher, Löwit, ANNUAL 1890, Talaman, Mayet, ii. E-4; Massart and Barde, R. Stierlin, D'Arsonval, ii. E-5. Identification of Human: Ewell, iv. J-6. Physiology of: Edington, Minot, Schäffer, Ranvier, v. H-1; Howell, Rollet, v. H-2; Rollet, Kühnemann and Mühsam,

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THERAPEUSIS.

BONE, DISEASES (continued).

Iodof. mixt. (10%) in *ol. oliva* or *glycerin*: before using, empty sac, wash with *boric sol.* iii. H-17. *Scott's mercur.* treat., by plaster. *Peruv. balsam.* iii. H-18.—*Bone-grafts* after excision. iii. H-25. *Resection of knee.* *Lucas-Championnière's meth.* iii. H-7. *Erosion of knee-jnt.*, *Ruiz's meth.* iii. H-9. Try arthrect. first in child.—*Conservatism* or *resection*. *Bidder's meth.* in *hip-jnt.*—*Resect. of patella.* iii. H-10. *Gritte's meth.* of *resect. of carpus.*—*Obalinski's meth.* of *resect. of foot.*—*Resect. of astrag.* iii. H-11. *Osteoplastic op.* iii. H-12. *Resection of symphysis pubis,* iii. H-13.

BONE-TUMORS.

GUNNER'S OSTEOMATA. Removal, iii. H-27.
HYDATID CYST. Puncture for diagnosis. If small, excise; if large, amputate. iii. H-27.

MALIGNANT TUMORS. Amputation: *Garden's meth.*—*Wyeth's meth.*—*MacLaren's meth.*—*Von Bergmann's meth.* iii. H-3. *Resection of sternum, scapula,* iii. H-7. *Resection of clavicle, entire and part.,* iii. H-10. *Vladimirow-Mikulicz osteoplastic op.* in *foot.* iii. H-12. *Disarticula.* of *hip-jnt.*, iii. H-25. In *sarcoma of long bones:* If *periosteal* in *femur*, amput. at *hip-jnt.*; if *central*, *erase* or *seize*. Total or partial resection. iii. H-26.

RIDER'S BONE. Do not operate if free from tenderness. iii. H-27.

BRAIN, DISEASES OF.

APHASIA, TRAUMATIC. Trehpine and raise or remove depressed portions of bone, ii. A-11.

ASTASIA—ABASIA. Strong electric current, ii. A-12.

EMBOLISM AND THROMBOSIS. Promote collateral circula.: *digitalis* with *ether* or *sp. ammon. aromat.* to strengthen heart. ii. A-18.

FOREIGN BODIES. Operative removal, if known; exploratory op., if suspected. ii. A-20.

HAEMORRHAGE. *External capsule:* Trehpine before blood breaks into ventricles, a little bel. and ant. to parietal eminence. To reach *intern. capsule, ant. and mid. part.* trephine at point midway betw. ant. and post. ends of *corp. striat.* and *optic thalam.*, respectively. Sitting-erect position: ice to head; hot wat. to feet; leeches about cerebral vessels.—Ligation of the extremities. ii. A-17. Recumbent posit., head and shoulders well raised: if much heat or throbbing about head, cold appl. or ice-bag and hot bottles to feet; if face flushed, give *pot. brom.* gr. xx (1.3 grms.), and *tinct. acronite.* ii. A-18. Avoid using alcohol, v. A-3. Massage, v. A-78.

PARALYSIS—AGITANS. *Cocaine*, gr. ss-ij (0.03-0.13 grm.), with *hyosine hydrobrom.*, gr. 1-100 (0.0006 grm.), in pil. 2 or 3 t. d. ii. A-44.

HYSTERICAL. Auto-suggestion: forced and passive movements; systemic faradization. ii. A-46.

TUMORS. Localization: trephining and removal, if possible. ii. A-28, 29.

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BLOOD (continued).

Cohnstein and *Zuntz*, ANNUAL 1889,
Ringer and *Sainsbury*, v. H-3; *Ringer*,
ANNUAL 1888, *Arthus* and *Pagès*,
Schenck, v. H-4.

BLOOD AND SPLEEN, DISEASES—*Frederick P. Henry*, ii. E-1.

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BONE-GROWTH—*Ollier, Neve, Drushkin, Martha Sommer, Wyeth, Thompson, Ponct, Gibney, Goodman, Middendorff, Deaver*, iii. H-24; *Kümmel, Murray, Ponct, Gibney, Goodman, Murray, Middendorff, Senn, von Bergmann and Lange*, iii. H-25.

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BONES, ANATOMY—*J. Janosik, Sir William Turner, G. B. Howes*, v. G-1; *Marimo, F. G. Parsons, Bland Sutton, Arbuthnot Lane, Thomas Dwight, Hyrtl*, v. G-2; *P. Poirier, Arthur Thompson, Shattuck, Parker, C. E. Stokes, Pfitzner*, v. G-3; *Denys*, v. G-7; *Pfitzner*, v. G-4.

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BRAIN, SURGICAL, DISEASES.
ABCESS. Trehpine; drain. iii. A-11. Trephine; Curette cavity. iii. A-12. <i>Pyramic thrombi in lateral sinus:</i> Trehpine for diagnosis; then expose int. jug. vein in neck, tie at 2 points, cut between; cleanse seat of disease with scoop, syringe with subl. sol. iii. A-16. <i>Hydrogen peroxide,</i> v. A-51.
 DURA MATER. <i>Inflammation and abscess:</i> Trehpine and drain, iii. A-20.
 FRACTURE OF BASE OF SKULL. Drainage by strip of subl. gauze and catgut.—Trehpine and drain. iii. A-35. Trehpine, iii. A-36, 37. Trehpine; remove clot with watch-spring scoop.
CRANIAL VAULT. Trehpine and remove clots, if hemorrh.; tampon. iii. A-33. <i>Punctured fracture;</i> trephine. iii. A-34.
 GENERAL PARESIS. Trehpining, iii. A-3.
 INJURIES OF SKULL (old). Trehpining, iii. A-42.
 INTRA-CRANIAL HEMORRHAGE. <i>Extradural:</i> Trehpining, removal of clot, iii. A-21. Tie common carotid, iii. A-1. <i>Intra-dural:</i> Trehpine, drain, iii. A-22. Trehpine, antisept. lavage, drain, iii. A-23.
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 PACHYMENTINGITIS. Trehpining. If gum-mata, remove by op. (?). iii. A-1.
 SHOT WOUNDS OF BRAIN. Trehpining, iii. A-39. Drain, if "through and through," with iod. gauze, iii. A-40. Trehpine, iii. A-41.
 TUMORS. Trehpine, remove, clean cavity, drain, iii. A-5-9. <i>Chronic hydrocephalus:</i> Iodine, puncture, incise, drain, iii. A-10. <i>Encephalocele:</i> Ligate and excise, iii. A-10; iii. K-55.
 VENTRICLES. <i>Hemorrhage:</i> Trehpine, remove clots. If effusion, tap and drain. iii. A-27.
 BRIGHT'S DISEASE.
LÉPINE'S DIETARY. Alkaline min. waters; digitalin (cryst.) for wk. hrt.; caffeine; avoid straphanthus; pot. iod. when arter. sclerosis; avoid vapor baths; always put pat. in bed; have equable temp. i. L-27.
STEWART'S DIETARY. Hygiene and diet; avoid cat. as diuret.—Pot. iod., if art. sclerosis.—Preserve renal tubules, and flush kidneys; avoid strong drugs and albu-forming foods; milk in some cases; koumyss or kefir, or infants' foods; egg occas., if no incr. of alb. app. in ur.; veget. without condiments; avoid spirits, alluv. apple or other fruit wine; out-door gym., baths, massage. i. L-28. Symptomatic treat. In parenchym. form, caution in use of drugs; rest in bed, diet, dry and vapor baths, pilocarpine. In interstitial form (syph.), pot. iod.; digital. for hrt.; bleeding, if high art. press.—Bed, cathartis, milk diet.—Milk in sm. quant. at first.—Peptonized milk and pot. iod., i. L-29.

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THERAPEUSIS.

BRIGHT'S DISEASE (continued).

LASIAKOV'S DIETARY. In interstitial form, with weakness, mixed diet, animal predom.; in parenchymatous form, with prof. albumin., veget. fd. with milk in excess. i. L-29.—Mixed comprehensive diet.—6 raw eggs daily.—Well-regulated animal diet. Salisbury steak, pure water only as drink; pass. exer.: tonic med.—Inject. of desrib. bld. serum, salt soln.; diuret. only if hrt. strong; if heart fail, catharsis, warm and vapor baths; milk diet, lim. amt. of meats and eggs. In ac. humor. form, ac. tannic.—In chronic form, fuchsin, cal., ac. hydrofluor., sol. hydrofluoride.—Foods in which ptomaines do not readily form: elim. toxines, limit introd. of toxines in fd.; caffeine, digitalis, strophan.; glucose and lactose by rectum. Oxygen inhal., bleeding. Diet: milk, eggs, starches, green veget., and fruits exclus. i. L-30. Ergot, iron, creanote combined.—Sol. chlorule, gr. x (0.65 grm.), in caps. t. i. d. with regimen. Antipyrr.—Sol. ichthyolate, gr. ix-xix (0.60-1.20 grm.), in caps.—Avoid iodides.—Glucose and lactose. i. L-31. Chloral amid. v. A-31. Oxygen, v. A-117. Vegetarianism, v. A-135.

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DRORBY. *Blatta Orientalis*, gr. v. (0.30 grm.), in sub-ac. stage only, v. A-20.
 HEMMATURIA (Malarial?). Quin., i. L-10.
 INSANITY. Milk diet, pot. iod., i. L-14.
 UREMIA. In gastro-intest. form, catharsis, avoid op. lest cerebral form be induced: oxygen inhala.; stimul. skin, kidneys, and other elim. funct. i. L-20. Pilocarp., hot-air baths; when pulse very tense, nitroglycer. i. L-28. In uremic convulsions, pilocarp. hypod.; morph. hypod. i. L-22. Prophylaxis: Diet, milk and veget., occas. eggs, pork; dry cups over triangle of Petit, sevl. t. d.; if sympt. threaten, leeches; if attack occur, direct deplet. of kid., copious draughts of milk and pure water, enemas of water ev. 1 or 2 hrs. Oxygen inhala. i. L-23. If stomatitis, loc. appl. salicyl. glycer., sol. calc. chloride, or lemon-juice, with arg. nitr. fusa, combined with general measures. i. L-21. Reside in Southern interior, Tennessee, Georgia, N. Carolina, Arkansas, Texas. v. D-6.

BRONCHITIS.

Sprays: Vin. ipemic, 3ij (8.0 grms.); tartar emetic (1-480) or vin. antim. and water, p. aq.; lobelia spray, if much spasm; pot. iod. sol. (2 %); steam inhala. m. and e.. with tinct. bensoin co., creasole, or ac. carbol.—Morph. acet., with pot. acet., gr. xx (1.3 grms.) ev. 2-4 hrs.—Sol. salicyl., pot. nitrat., pulv. Doveri, 55 gr. ij (0.13 grm.) ev. 3 hrs.—Ammon. chlorule int. and as inhala.—Terebene.—Tinct. cocillane, gas-ij (2.0-8.0 grms.) ev. 2-3 h. i. A-8. Ext. cocillane Ad., gtt. v-xxv ev. 2-8 h.—Ethyl iodide, Mx (0.65 grm.), inhal. from kerchief. in B. complicated with Bright's dis. and fatty hrt., and feeble circula. with viscous secret. and dyspn. i. A-9. Acetanilid, with pulv. ipemac. et opii comp., v. A-1. Amylene hydrate, v. A-7. Calcium sulphide, v. A-24. Eth. tinct. caprii, with aq. ammon., ol. terebinth., and ol. lini ext., v. A-28. Chloral amid, gr. xv-xlv 1-3 grms.), v. A-30. Tinct. Cocillane, gas-ij (2.0-8.0 grms.), or fluid ext. gtt. v-xxv in dry form, sub ac. and chr. stages, v. A-39, 40. Franz-Josef waters, dil. with hot water bef. breakf. in chr. B., v. D-27.—Cocillane contra-indic. in certain forms of senile B., with atheromatous changes; ammon. carb. safer. v. A-39. Codeine, gr. ss- $\frac{1}{4}$ (0.03-0.05 grm.) 5 t. d.. v. A-42, 57. Naregamia as an expectorant, v. A-101. Oxygen, v. A-117. Sulphonal, v. A-133.

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- CUMULATIVE.** *Pil. rheico.* ev. h. until defeca. is complete. i. D-9.
- HABITUAL.** Massage. electric., abund. exercise. Metal ball (3 to 6 lbs.) rolled over course of colon for 5 to 10 mins. ev. morn.: begin in r. iliac reg. Elect. (galva. or farad.) over colon. Regular exerc., walking, riding, gymnastics. Avoid fecal accum.; enema. pref. to drugs: *pantophyllin*, gr. 1-10 to 1-5 (0.006-0.0012 grm.); *ext. aloes*, *ext. rhei*, 22 gr. i-ij (0.063-0.13 grm.); mix. Sig.: At bed-time. i. D-8. Rectal douche. i. D-15. Marienbad: Chatel-Guyon; Brides-les-Bains. v. D-26. Hunyadi János; Colorado Springs. v. D-27. Electricity, v. C-8. Hypnotism, v. A-61.
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- IN CHLOROTIC AND DYSPEPTIC WOMEN.** Fer. et am. citr., ext. carcar Ad., 22 40 pts.; saccharin, 1 pt.; water, 4000 pts.; M. A teasp. bef. meals. i. D-8.
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AUTHORS QUOTED.

- CLIMATOLOGY (continued).**
v. D-18: J. V. Shoemaker, F. S. Bascom, C. L. G. Anderson, Tyndall, C. von Ruck, T. G. Horn, H. B. Moore, v. D-19: P. C. Remondino, F. Gundrum, Banff, J. Murray McFarlane, Boardman Reed, v. D-20; W. F. Hutchinson, G. Bardet, Rinck, ANNUAL 1888, 1889, 1890, J. Gelbke, Oertel, v. D-21: Gelbke, Peters, Dettweiler and Bremer, F. Pensoldt, D. J. Leech, A. Hoeseli, v. D-22: Arthur Foxwell, A. A. Gore, J. Burdon Sanderson, F. M. Sandwith, Medical Press and Circular, Gandil, v. D-23. *General Considerations:* Domingo Orvalhano, F. D. Bullard, v. D-1; Jansen, v. D-2.
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COMPLICATIONS.

DIABETIC COMA. Free use of *sod. carb.* by
mouth, and by intra-venous inject. with
sod. chloride.—For wk. heart, prophyl. or
act. treat. as req.; before collapse, exertion
and card. depress. to be avoided, card. stim.
to be used; during attack, use utmost
stimulus, elim. toxic cause in intest.; give
ol. ricini freely, even if diarrh. is present.
i. G-80. Inject. saline sol. intra-ven. (temp.
benefit); saline sol. containing *sod. chlor.*,
pot. chloride, *sod. phosph.*, *sod. sulph.*, *sod.*
bicarb. in water. (3vij (3136 c.c.m.), in
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DIARRHEA, IN ADULTS.

Intestinal antisepsis. *Bism. salicylate*,
magnes., *sod. bicarb.*, 22 gr. v (0.32 grm.);
M.—*Bism. salicyl.*, *crete prep.*, *calcis*
phosp., 22 gr. v (0.32 grm.); M.—*Bism.*
salicyl., *beta-naphthol*, *iodol*, *pulo. carbo*
ligni, 22 gr. v (0.32 grm.); M. *Infus.*
hysterionicae baylichean. i. D-1. *Copper*
arsenite, gr. 1-100 (0.10065 grm.) in water,
giv-vj (120-180 grms.); a teasp. ev. 10-15
min. for first hr., then a teasp. ev. hr.—
In inf. & dis., where no effect from astring.
chlorodyne, gtt. xv. hy pod.—*Ac. carbol.*
enema, gr. i-3vj (0.07-140.0 grms.) when
bowel empty, after a prev. inject. of *pot.*
chlor., gr. v (0.32 grm.), to aq.; 3j (3.0
grms.), to remo. e nucleus.—*Sol. zinc. sulph.*
(1-240), 3j (60) c.c.m.) as enema, 1 or 2 t.
d., with careful regimen. i. D-2. If due to
deficient secretion, *podophyllin*; *sod. resin.*
podophyllin in alcoh. (1 80), gtt. ev. 5 hrs.
to child under 2 yrs.—In mucous passages,
sod. subl. (1 5000), teasp. ev. 5 hrs. i. D-3.
Hydro-naphthol, gr. iii-iv (0.20-0.25 grm.)
ev. 2 hrs., v. A-52. *Kola-nut*, v. A-75.
Vegetarianism: vegetable diet, eggs, milk,
and fruit v. A-135.

CHRONIC.

Guarana puto, 2 t. d.—Absol. rest; diet,
equab. temp., massage; *solol*, large doses.
i. D-2. In tropical forms, *santonin*, gr. v
(0.33 grm.) at bed-time in a teasp. of *ol.*
olive for 6 d., i. D-3. *Iodol*, v. A-69.

DIARRHEA, IN CHILDREN.

DIET. Starve for 12-24 hrs.; give water,
water and brandy, sml. amt. chicken-
broth. When vomiting, all fd. cold; when
milk can be retained, dilute it largely.—
Give water freely, chamomile-tea, fennel-
tea, baths. One pt. milk to 9 pts. water,
grad. incr. milk to $\frac{1}{4}$ or $\frac{1}{2}$. i. E-16.
Rachford's rules of diet: 1. *Arid alb.*
fds. (a) when marked constitu. sympt.; (b)
when in doubt as to kind of ferment. (acid
or putrid); (c) putrid stools; (d) mucous
or bloody stools; (e) when constant nausea,
not relieved by vom. 2. *Arid carbohydrates* (a)
when no marked constitu. sympt., and stools are contin. acid; (b)
when much flatus, pain, and urticaria. 3.
Give fds. as cream, beef-broth, whisky (a)
when fds. as above disagree; (b) during
first 24 hrs. in severe, acute cases; (c)
when in doubt as to what fd. is indica.—
Cream, prop. diluted, rarely contra-indi-
cated; best in chr. cases, and in later
stages of ac. cases. Barley-water alone or
with milk. i. E-17. *Avoid* white of egg
when constitu. sympt., and in putrid or
mucous stools.—Meat-juices in chr. cases
where other alb. fds. disagree. Milk must
always be sterilized and well diluted. i. E-
18.

MEDICINAL. Fewer drugs, smaller doses.
Disinfect. drugs. Mechan. meas.—Stom-
ach-washing (see also i. E-5). *In begin-
ning of attack:* Evacuant, *calom.*, *ol.*
ricini; change diet, withhold all fd. for a
time. i. E-18. Withhold op. and astring.
In earlier stages and in beginning of treat.
in any stage. Stomach-washing, if vomit-
ing; irrigate colon. *In later stages*, *bism.*,

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A-9.</i> <i>Aristol.</i>, v. A-14. <i>Kaori.</i>, v. A-74.</p> <p>CHRONIC. <i>Menthол, 2-10 pts.; bals. Perur., 5 pts.; lanolin, 100 pts. M. iv. A-52.</i> With infiltration, ac. salicyl. Of children, sulphur ext.; ichthyol, gtt. v-x, 2 or 3 t. d.. intern. iv. A-55. <i>Glycerin sapon.</i> (87%), 95 pts.; ac. salicyl., 5 pts.; M.—Glycerin sap. (80%), 90 pts.; ac. salicyl., resorcin albiss., 5 pts.; M. iv, A-57. <i>Alcohol contra-indicated, v. A-4.</i> <i>Picric acid, v. A-123.</i></p> <p>PAPULAR. <i>Thiol, suspend in water (1-3), iv. A-54.</i></p> <p>SCALY. <i>Ammon. sulpho-ichthyolat. (5%). iv. A-58.</i></p> <p>SEBORRHOIC. <i>Potassa, zinc oxide, sulphur, resorcin, pyrogallol, chrysarobin, tar.</i> Choose drug accord. to grade of infl. When much infl. and disch., zinc oxide, lead oxide, sulphur, resorcin, in powd., paste, or gelatin. When lower grade of infl., the other remed. in oint., salve-mulls, and imperv. bandages. Prefer applica. which acts most strongly against specif. germ with least irrita.—Artif. irrita. in appar. healed patches for ding.—Arsenic, intern.—Chrysarobin, super. to pyrogallol. iv. A-15. <i>Hydroxylamin, alc. sol. or oint. (3%—1½%), iv. A-52.</i></p> <p>SENILE. Bulkley's treatment: At beginning, pill of blue mass, colocynth, and ipecac; repeat if necess.; later, pill of aloes and iron a. p. or sm. dos. of calom., gr. 1-10 (0.0065 grm.) a. p.; pot. acet., gr. x-xv (0.65-0.97 grm.) t.i.d., p. p., with nux vom. in infus. quassiae; later, Startin's mixt., with s. t. strych.—Arsenic, when tendency to form bullae, in large doses, dil. with Vichy. Quin. s. t. of use. Sedatives. Phenacetin, gr. v. (0.32 grm.) in hot wat. on retiring; repeat in 1 hr. if neces. Anti-sebrin, gr. vij (0.39 grm.).—Tinct. gelsem., gtt. x-xx with tinct. aconite, gtt. j. iv. A-51. Avoid opium and alc.—Dimin. diet in proport. to age and want of activ.—Local treat. When extensive E.: pulv. calamine prep., 3ij (7.7 grms.); pulv. zinc oxide, 3iv (15.5 grms.); ac. carbol., 5i-ij (3.9-7.7 grms.); glycerin, 3vi-viii (23.3-31.0 grms.); aq. calcis, 5j (31 grms.); aq. rosar., ad fijvijj (250 grms.); M. If localized thickening, use: Pulv. zinc oxidi, 3j (4.0 grms.); ungt. picis, 3iv (16.0 grms.); ungt. aq. rosar., 3iss (46 grms.); M. Spread on lint and bind on patches—Tinct. menthol. (1-3 to 50); liniment (3 to 30 each of ol. olive and lanolin); may incr. to 10% or 15%. iv. A-52.</p> <p>EMPHYSEMA. <i>Ammon. muriate; potass. iod.</i>—Free drainage. i. A-46. Massage of heart, i. B-42. Salaghi's mechanical treat., i. B-42.</p> <p>EMPYEMA. Evac. pus already formed, re-establish the normal condit. of respir. appar. -Bülan's meth. of permanent aspira.—Incis. and resect.—Exploring needle. i. A-45. Early aspira. with grad. drainage, iii. B-16. Paracentesis; Small opening and impred.</p>	<p>ELECTRO-THERAPEUTICS (continued). C-26; M. Vogel, Graefe, Voltolini, v. 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unisite). *Sulphonat.* in hot milk or with
finet. larundul., in restlessness. Venesection.
Oertel's treat. not advised. i. B-9.
Alcohol contra-indicated, v. A-4. *Chloral-*
amid, gr. xv to xl (1-3 grms.), in pill or
caps., v. A-30.
- ENDOMETRITIS.
- No intra-ut. treat. if menstrua. is present
or imminent, or if ac. infl. is present; anti-
cipate and provide for severe haemorrh. in
malign. disease of cerv.: reineimb. risk of
infl. react. in remote poly. structures. ii.
F-15.—Curette and antisepsis; no contra-
indica.—Sharp curette and antisep. ii. F-16.
Details of opera.—Free dilata. and drain.—
Antrophores, with zinc chlor. (1%), cupri
sulph. (3-10%)-1%, resorcin (10%), tannin
(5%-10%) in fungoid E.; sublim. (1-10%),
creasote (2%), subl. (1-10%) with zinc chlor.
(1%) in gonorrhœal E.; when using zinc
chlor., resorcin, and creasote, coat auto-
phore with cocaine to prev. colic.—In mild
cases: 8 days after term. of menses, irrigate
vag. and cerv. with hot 1.5% sol. ac.
boric, combined with sol. subl. (1-20%). ii.
F-17; then remove all muc. and apply sol.
zinc chlor. (5%) over surf. muc. membr.;
rep. 2 or 3 t., at interv. of 8 d.; increase
strength of sol. if neces.: if fungosites,
sol. ac. chrom. (1-3); may altern. with the
zinc; apply only to diseased tiss., and sol.
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Jarnin): Intro. insula. electrode into
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sev'l. times, the other electrode applied on
side of thigh. Grad. distens. of blad. with
warm. wat., fol. by pot. acet. to neutr.
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to keep ur. from neck of blad. If from
deep sleep, night-light: elect., faradic,
large flat electr. over last dors. and first
lumb. vertebr., a sml. one moved with
stroking over blad.; strychn., rhus aromat.
—Atropin. *Belladon*.—Norm. liq. ergot,
gtt xx-3ij (8 grm.), in wat. t.i.d.; if nausea,
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<i>Rubidium and ammonium bromide, gr. xxx (2.0 grms.) t.i.d., increased to gr. lxxv (5.0 grms.) if necess.—Sud. baborate, gr. xv-xxx (1.0-2.0 grms.) daily, increased to gr. lxxx (5.0 grms.); especially good in nocturnal ep. (?) . ii. A-35.</i>	
<i>Treat general condit. Bromides well diluted and long contin.; children bear larger propor. dose than ad.; increase dose bef. any unus. strain. Dimin. dose if pat. without manif. for 3 yrs. "Therap. bromism;" avoid "path. bromism." If bromides not well borne, or severe acne, diminish brom. and add chloral, or s.t. strychn. or atropine. Arsenic against acne. ii. C-80.</i>	
<i>Alcohol, contra-indicated. Antipyrin, v. A-12. Bromides in sm. doses at beginning, not more than gr. xx-xxx (1.5-2.0 grms.) daily; incr. this amt. by gr. x (0.6 grm.) ev. 2 or 3 wks; 3iss-ij (6.0-8.0 grms.) should not be reached in less than 6 mos. v. A-20. Methyl-acetanilid, v. A-97. Sulphonal, v. A-133.</i>	
<i>EPISTAXIS.</i>	
<i>Fifteen long threads of patent lint, 3½-4 inches (9-10 centim.) long, doubled on themselves, and tied in middle by string, one end left 6 or 8 in. (15-20 centim.) long for easy extract; pass bundle of threads back into post. nares by probe and leave there; withdraw probe, plug ant. nares.—Drain. tube 10 in. (25 centim.) long as subst. for Bellocq's canula.—Hot-wat. irriga.—Iod.of. tamp. iv. D-13. Dionisio's compression method (rubber sac surrounding canula). iv. D-37. Hydrastis and sclerotic acid, v. A-50.</i>	
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<i>ERYTHEMA, INTERTRIGO.</i>	
<i>Aristol, iv. A-50. Picric acid, v. A-123.</i>	
<i>MULTIFORME. Ac. horic sol. on compress., sol. by bism. subnitr. dress., iv. A-51. Dry, powd. thiol., iv. A-54.</i>	
<i>ETHER-DRINKING HABIT.</i>	
<i>Legal restriction of sale in small quantities, iv. I-11.</i>	
<i>ETHYL BROMIDE, ANESTHESIA BY.</i>	
<i>NARCOSIS. Avoid giving to drunkards or in dis. of heart or lungs. Watch pulse. iii. P-20.</i>	
<i>EXOPHTHALMIC GOITRE.</i>	
<i>Acetazine; light bandaging of protruding eyeballs. ii. C-81. Digitalis not well borne; use tinct. strophanthi, gtt. viii-xxv. t. i. d.—Ammon. carbazotate, gr. j (0.065 grm.) in pill t. i. d. for 1 wk.; second week, gr. ij (0.13 grm.) t. i. d.; third week, gr. iij (0.19 grm.) t. i. d., if it can be borne; Combe's meth.—Ammon. carbaz., gr. ij (0.13 grm.), grad. incr. to gr. iv (0.26 grm.) t. i. d., alternated weekly for a year with tinct. strophan., gtt. x, grad. incr. to gtt. xxx, t. i. d.—Warm bath for ¼ hr. or more daily, with elastic press. ab. or bel. knees when deriv. act. of bath is insuff.; syptic collod. on thyroid, enforced by elastic truss; daily galvaniza. of thyroid (pos. pole on thyroid, with electrode of potters' clay moistened with iodi over thyroid; neg. electrode, large flat sponge, on back of neck).—Extirpa. of goitre.—Thyroidectomy, complete or partial. iv. H-9.</i>	
<i>EYE, DISEASES.</i>	
<i>CHOROID, DISEASES.</i>	
<i>CHORIO-RETINITIS, Central and Dissemi- nated: Merc. bichlor., hypod.—In myopes, merc. bichlor., gr. 1-6 (0.01 grm.) daily, in pill, omit for 1 mo., then resume, with inject. of pilocarp. ev. 2 d.—Merc. inunct.,</i>	

AUTHORS QUOTED.	
<i>ETHER—Anesthesia by:</i>	Robert Weir, iii. P-15; Kappeler, St. Germain, J. R. Comte, iii. P-16; Dumont, George Fowler, Butter, J. A. Squire, L. Brunton, W. A. Gorton, Harrington, iii. P-17; E. S. Perman, Wolverhampton and Staffordshire General Hospital, iii. P-18.
<i>Menstruum in Dermatology:</i>	Sawyer, iv. A-60. Therapeutic Uses: Horatio C. Wood, George Eastes, v. A-45; Peter, Jacoud, Roussel, v. A-46.
<i>ETHER-DRINKING HABIT—</i>	Hart, H. N. Draper, iv. I-6; Richardson, C. H. P. D. Graves, Hetherington, Nevin, J. W. Watson, iv. I-7; Norman Kerr, Carter, C. H. P. D. Graves, iv. I-8; Bernard, De Quincey, iv. I-9; J. W. Watson, Walter Bernard, iv. I-10; Hetherington, Walter Bernard, Hart, iv. I-11.
<i>ETHYL BROMIDE, ANESTHESIA BY—</i>	E. Haftter, iii. P-19; Thiem, Kocher, Haderup, iii. P-20.
<i>ETHYL FLUORIDE, ANESTHESIA BY—</i>	Henri Moissan, iii. P-22.
<i>EUCALYPTUS ROSTRATA—</i>	W. M. Russell, v. A-46.
<i>EUPHORBIA PILULIFERA—</i>	Rosecrans Workman, v. A-46.
<i>EXECUTIONS, JUDICIAL—</i>	Medical Record, iv. J-16; B. W. Richardson, Benjamin Franklin, iv. J-18; Paul Joye, iv. J-19.
<i>EXOPHTHALMIC GOITRE—</i>	Seguin, ii. C-81; H. W. G. Mackenzie, Seligmüller, Filehne, Durduff, iv. H-6; ANNUAL 1890, Hale White, Biensfai, Fileline, G. M. Hammond, Nothnagel, Jaecdond, Kast and Wilbraad, J. R. Reynolds, Louise Fiske-Bryson, iv. II-7; Fiske-Bryson, G. M. Hammond, H. W. G. Mackenzie, Joffroy, Balle J. Boedecker, Nothnagel, Kahler, Hale White, iv. H-8; Ferguson, Hammond, Combes, Boaz, J. L. Corning, Stierlin, Kümmell, iv. H-9.
<i>EYE, ANATOMY—</i>	Fick, Gürber, v. G-23; Angelucci, Pfister, Boucheron, Dogiel, Peters, Harder, Steida, v. G-24.
<i>EYE, DISEASES—</i>	Charles A. Olliver, iv. B-1.
<i>ANOMALIES—</i>	Nieden, Bock, Daniels, Hess, iv. B-1; Davidson, Chauvel, Frick, Van Duve, Nicolin, iv. B-2; Odillo Maher, Zirm, Samuelsohn, F. P. Smith, Fage, Frank, Günsburg, Plange, Sogge, Ciesel, iv. B-3; Tako, G. Lindsay Johnson, iv. B-4; Norton, Weyert, iv. B-5.
<i>CHOKOID, DISEASES—</i>	Chorio-Retinitis, Central: Darier, Abadie, Culbertson, iv. B-93. Chorio-Retinitis, Recurrent: Theobald, iv. B-93. Ossification: Wood, iv. B-93. Tuberculosis: George Carpenter, iv. B-93. Tumors: Bock, iv. B-68; Guende, Fuchs, Jocqs, Meyer, Gayet, iv. B-92; Guende, iv. B-93; Hotz, Bane, Wadsworth, Ewing, iv. B-94; Mitvalsky, iv. B-95.
<i>CILIARY BODY, DISEASES—</i>	Ciliary Muscles, Voluntary Control: Norton. Cicitis, Pathology: Rijnberk, Straub, Raab and Herzog Carl, iv. B-79. Tumors: E. Smith, Lange, Lagrange, Ivanoff, iv. B-80. Uveal Tract, Inflammation: Brandenburg, iv. B-80,

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THERAPEUSIS.

EYE, CHOROID, DISEASES (continued).
 fol. later by merc. bichlor. by mouth for 1 or 2 mos. *Recurrent:* If prof. sympathetic inst. in other eye, enucleate; if unsuccessful, do iridect. or sclerot. iv. B-93. *Pyocyanin*, iv. B-146.
CHOROIDITIS, Disseminated: *Pyocyanin*, iv. B-146.
SARCOMA. Enucleate, iv. B-94.
CILIARY BODY, DISEASES.
MELANOSARCOMA. Removal, iv. B-90.
CONJUNCTIVA, DISEASES.
CONJUNCTIVITIS, CATARRHAL AND PHLYCTENULAR. Smoked glasses; instill sol. cocaine (1%) gtt. j; fol. by insuffia. of calom. on phlycten. iv. B-60. Remove calom in 10 min.; no collyr.; if photophobia, instill sol. atrop. (1/20), gtt. 1 ij; discolor. when ac. stage subsides; at same time wash conjunctiva with warm boric sol. 4 or 5 t. d.; intern., calom. gr. 1/4 (0.013 grm.) ev. hr. for 10 day; rep. in 10 d.; avoid caut. and irrit. collyr.—*Merc. bichlor.* iv. B-61. In acute C., spray of ac. boric (1/30) or (1/40), of zinc sulph. or cupri sulph. (usual collyr. strength). In chro. C., spray of iod. 1 pt.; pot. iod. 4 pts.; aq. dest. 20) pts.; M.; if pain, precede by cocaine sol.—*Glycerite of iodof.* (10%), instill after thor. cloths. of conj. sac. iv. B-62. Thermocaut. iv. B-72. *Auramin*, iv. B-147.
GRANULAR AND TRACHOMA. Reside at high altitude, iv. B-63. Cleanliness. Jequirity infus. "Johnson's new treat." iv. B-65, 66. *Glycer., tannin* (1-10), sol. subl., sol. plumbi subacet. (1-10); betw. caut., cold compr. and antisept. collyr.; if pat. cannot be seen ev. 2 d., caut. as oft. as pos.; in interv. use once daily, within conj. sac. oint. of iodoform, ol. radini, hydrarg. ox. Acr., or ac. curbit., 1 pt.; vaselin, 10 pts.; M.; or cupri sulph., 5-15 pts.; vaselin, 1000 pts.; M. Coquilles for const. wear. If pain, frict about orbit with oint.: ext. bellad., 3 pts.; ungt. hydrarg., 10 pts.; M.; ol. morrh. int.; if tendency to ulcera. or abscess, replace oint. by collyr. of pilocarp. nitr. (5 to 15 pts.-1000), with hot fomenta.—Expression with ring-forceps, and freq. lavage of conj. with subl. sol. (1-2000) or (1-4000) and occas. use of hg. ox. A. or cupri sulph. as stim.—If cartilag. gran., rasp nodules with pumice-stone: rep. till conj. smooth and healthy. iv. B-66. *Sol. naphthol* (5%) appl. with brush ev. morn., fol. by fresh water to lids; if pannus and corn. ulcera., ungt. hg. ox. A.—If entropion, excise dis. membr.; transplant a piece of thin skin, or m. m. from lip. iv. B-67. Electrol., v. C-9. *Methyl violet and auramin*, iv. B-146. If pannus, proc. jequirity, iv. B-149.
OPHTHALMIA, GONORRHEAL. Avoid arg. nitr. till dis. is on decline; avoid spray appar. for fear of inoculating the attendant. iv. B-50. Uninterrupted appl. of cold. compr., and cleansing of eye with sol. ac. boric sol. by fountain-spr.; in severe cases instill sol. arg. nitr. (2%); if corner hor. hazy, sol. atrop.; avoid solid stick arg. nitr.; protect healthy eye. iv. B-58. *Pyocyanin*, iv. B-147.
NEONATORUM. Hégar-Kohrm meth.: Antisept. lav. of face and eyelids with Van Straten's sol. (subl. sol. 1-1000). iv. B-58. Crede meth.: Instill sol. arg. nitr. (2%), gtt. j into each eye as soon as born; if irrit., fol. by sol. ac. boric.—Contin. appl. of cold; wk. sol. arg. nitr.—Lav. with decoct. aromat.: collyr. of tannin. iv. B-59. Health laws for prophyl., iv. B-60. Sol. methyl violet and aniline red (2%), v. A-8.
PURULENT. *Sol. alpha-naphthol* (1-5000).—If corneal ulcera., galv.-caut., with freq. caut. with sol. arg. nitr. (2%-3%). iv. B-59. *Hydrogen peroxide*, v. A-51. *Pyocyanin*, iv. A-147.
SYMPATHETIC. *Pyocyanin*, v. A-146. Enucleation.—Iridectomy. iv. B-113. Antiseptis: caut. pt. of infect. with galv. caut.; inject sol. subl. (1-1000) gtt. ij within globe; enucleation; resection; prophyl. resection. iv. B-114. If late in appear., sevt. of optic and ciliary nerves behind globe. Exenteration. iv. B-116,

AUTHORS QUOTED.

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CORNEA, DISEASES—Abcess: Hansell, Saemisch, iv. B-72; de Schweinitz, Bourgeois, Panas, iv. B-73. *Buphtalmia:* Störling, iv. B-75. *Central Cornea:* Grandclement, Gayet, iv. B-75. *Cysta:* Czernak, iv. B-68; Borel, iv. B-73. *Episcleritis:* Pooley, iv. B-75. *Foreign Bodies:* Theobald, iv. B-67. *Herpes:* Decker, iv. B-68; Stellwag, iv. B-69; Decker, Ranshoff, ANNUAL 1890, Stellwag, Adler, Fuchs, Rouss, Groenouw, iv. B-70. *Keratitis, Dendritica, Exulcerans Mycotica:* Makrocki, Emmert, Hansen-Grut, iv. B-69; Hodges, Thompson, Wheelock, Rosenzweig, Park, Pfister, Haab, Vossius, iv. B-71; Jackson, Gutierrez-Ponce, A. D. Williams, iv. B-72. *Lecuna, Central:* W. F. Smith, iv. B-76. *Opacities:* Groenouw, Adler, Fuchs, iv. B-68; Forster, iv. B-69; Grandclement, Gayet, iv. B-75; W. F. Smith, iv. B-76; Fischer, Schoeler, iv. B-79. *Staining with Fluorescein:* Thomalla, Randolph, iv. B-73. *Thickening, Prismatit:* Linceann, iv. B-67. *Transplantation, Corneal:* W. F. Smith, iv. B-75. *Tumors:* Galesowski, LaGrange, Webster, Bock, F. T. Smith, Alt. Valude, iv. B-74; Fage, iv. B-75. *Ulceration:* Gifford, A. D. Williams, Ledbetter, Bettromieux, Saemisch, Lambert, Huntley, iv. B-72; de Schweinitz, White, Cheatham, Bourgeois, Panas, iv. B-73. *Wounds:* Barclay, iv. B-109. *Xerosis:* Kollock, iv. B-70.

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B- 149 skiascope, Burnett's. iv. B- 151 Wiirdeleman's.....iv. B- 152 strabismometer, Grädle's.....iv. B- 150 and retinoscope, Cliniborne's.....iv. B- 150</p>	<p>EYE, CONJUNCTIVA, DISEASES (continued). PTERYGIUM. Tear or clip apex close to cornea; divide flap back to its base; no conj. sut. used; "wing" left free; collyr. of copper, cocaine, and ac. boric to hasten shrinkage. iv. B- 53. Thermo-caut., iv. B- 72. TUBERCULOSIS. Excise affect. part.; galv.-caut. to surf. of wnd.; destroy all visible nodules. iv. B- 56. TUMORS. Excision. iv. B- 55. CORNEA, DISEASES. ABCESS. Eserine super. to atrop.; cocaine only a symptomat. remedy, injur. if long contin.: The Saemisch op. infer. to simple division of the abscess. iv. B- 72, 73. BUPHTHALMIA. Sclerot. sup. to iridect., iv. B- 75. CONICAL CORNEA. Tattooing. iv. B- 75. CRSTS, CICATRICIAL. Loosen prolapsed iris with destruct. of scar-tiss. by op., if aff. is old. iv. B- 68. ERISCLERITIS. 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(1/2-1%). TUMORS—DERMOID CYST. Removal by op.. iv. B- 73. EPITHELIOMA. Ablation with knife; galv.-caut. to pr. return.—Enucleation; seal orbit by scalping tarsal borders from outer canth. to lachrym. puncta. iv. B- 74. MELANOSARCOMA. Exenteration, iv. B- 74. ULCERATION. Unct. hydrarg. or. star.. iv. B- 67. If with hypopyon, iridect. prof. to Saemisch's op. In perforating U., early paracent. of cornea into the U.—Knife and actual caut. iv. B- 72. Eserine.—If no iritis, oint. of eserine, pilocarp., cocaine, iodof.; M.; if iritis, substit. atrop. for eserine.—If U. in deep, eserine.—Lav. of conj. cul-de-sacs; if dis. of lachr. ducts or of nose present, daily lav. If U. without hypopyon, thermo- or galvano-caut., or sol. arg. nitr. (2%), fol. by iodof. and antisept. dress.; if hypopyon, paracent., fol. by lav. of ant. chamber with Panas's sol. (Merc. binod.). iv. B- 73. Subl. sol. (1-5000), fol. by iodof. ev. 2 hrs., iv. B- 141. Sol. methyl violet (1-1000), iv. B- 146, 147. 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2d Col.—Fe to Fr.
3d Col.—Fe to Fr.

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THERAPEUSIS.

FEVER (*continued*).
 enema, ac. tannic, $3\frac{1}{4}$ -iss (3.0-6.0 grms.), and ac. carbol. cryst., gr. iss-viis (0.10-0.30 grm.), with or without quin., gr. xv-xxx (1.0-2.0 grms.). Phlebot. 3xxij (650 c.c.m.) of temp. benefit. i. H-40. Aconitine and ceratrine combined. v. A-3. Antimony, v. A-11. Hydrochinone, v. A-51. Pyrogin, gr. $\frac{3}{4}$ -lij (0.05-0.2) grm.). v. A-127. Sodium paracresolinate, adults' doses, gr. vi-vlij (0.40-0.53 grm.) daily; in child 12 yrs. of age, gr. j (0.07 grm.) given within 3 hrs. gave excellent effects. v. A-129.

FILARIA SANGUINIS HOMINIS.

Drink only boiled and filt. wat.: do not bathe in wat. wherein mosquitoes lay eggs.—Maintain genl. tone till adult parasites die. i. F-15.

FISTULÆ.

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RECTO-VESICAL. Prelim. inguinal colot., if openings are high up; subseq. closure of openings in vagina.—Episiotomy. ii. H-23.

URETHRO-VAGINAL. Repair by denuding edges of vag.; pass sut. so not to penetrate ureth. in. in. ii. H-26.

VESICO-UTERO-VAGINAL. Coe's op., ii. H-26.

VESICO-VAGINAL. Trendelenburg's op. (through supra-pub. wound). ii. H-21. Edges of m. m. of blad. sut. with catgut, silver-wire sut. in vag.—Burnett's op. (double line of sutures).—Vaginal op.—Op. through supra-pub. section.—Flap from post. vag. wall. ii. H-22. Tait's op., ii. H-22, 23. Joye's forceps, ii. H-24.

FRACTURES.

GENERAL TREATMENT. Massage. when near jnts.—Zinc phosphide, gr. $\frac{1}{4}$ -ss (0.016-0.032 grm.) daily, int. iii. I-1. Foulerton's pl.-of-Paris splint. iii. I-5. Electr. to remove callus, v. C-25. Massage, v. A-80-81.

SPECIAL FRACTURES. CLAVICLES. Simultaneous of both: Dorsal recumbence. iii. I-2. FEMUR—Ununited, of neck: Post. incis., freshen bony surf., metal sut. of fragm.; after few days withdraw sutures. iii. I-4. FEMUR—Shaft: Long orthoped. hip-splint. —Hodgen's suspension-splint. iii. I-5. HUMERUS—Through anat. neck, with disloca. of head into artilla: Incise ant. fold of axil., expose hd. of bone, and remove (?) —HUMERUS—Separation of upper epiphysis: Excise $\frac{1}{4}$ inch of shaft. iii. I-3. LEG—Foulerton's plaster splint., iii. I-5. NON-UNION AND DELAYED UNION—Animal bone-grafts, removing intermed. fibrous tiss. iii. I-1. PATELLA—Non-op. treat.—Arthrot. and metal sut.—Subcutan. wire sut.—Subcutan. silk sut. through tend. of quadriceps and lig. patell. iii. I-5. PELVIS—Compound traumatic separation of symphysis: Wire bones, p.-of-P. pelvic splint; later, iron pelv. clamp. iii. I-4. TIBIA, UNUNITED. When union prevented by repair of fibula holding tibia apart, resect fibula, freshen ends of tibia, and wire. If fibula unfractured, or dislocated from tibial head, resect fibula at once. iii. H-13. VERTEBRAE—Arches of vertebrae removed and dura opened. Non-oper. treat. advised. iii. I-2.

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THERAPEUSIS.

FRONTAL SINUS, DISEASES.

ABSCESS. Open from without; lavage
of track with carbol. sol.; dr. tube into
nose through opening; cleanse pts. t.i.d.—
Trehpine naso-frontal region.—*If* A.
points on ridge of orbit, and does not
orig. in ant. nares, ext. opening; dr. tube
to reach to sinus, no longer; lavage, wk.
sol. merc. binact. iv. D-32. *To syringe*
sinus, artific. opening must be made, iv.
D-33.

OSTEOMA. Remove by op. Trehpine sinus.
iv. D-33.

FURUNCLE.

Carbolic spray.—Carbol. sol. (1½%–2½%).
inject (Hüter's meth.) after incis., iii.
L-6. Compress, with hot ac. carbol. sol.,
deep incis., iodoform. dress., iv. A-51. *Arsenic*
disulphide, gr. 1-100 (0.00065 grm.), iv.
A-59. *Calcium sulphide* in early stage,
v. A-23.

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Stomach-pump.—Artificial respira.—Ether
hypod.; brandy by rectum. v. A-47.

GALL-BLADDER, SURGICAL DISEASES.

GALL-STONES. Olive-oil, large doses. i. C-
33. Ether or ether and alc. subcutan.—
Press on fundus with hand, if no ulcer.—
Cumpho-phénique, gr. iv-x (0.25–1.3 grm.)
ev. 4 h. In eth. sulph. and iyr. zingiber.—
Abdom. manip., hot foment., opium.—
Cholecystotomy.—Cholecystenterotomy.—
Vichy. i. C-34. Cholelithotripsy, iii. C-50.
Cholecystotomy, iii. C-51. Cholecystectomy,
iii. C-51. *Chloralamid*, gr. xv-ix (1–4
grms.) for pain, v. A-31. *Olive-oil*, 3iii-vj
(100–180 grms.), combined with a little
menthol; repeated doses. v. A-107.

OCCLUSION OR DUCTUS CHOLEDOCHUS. By
impacted stone, cholelithotripsy, iii. C-50.
If permanent: cholecystenterostomy, iii.
C-53.

GANGRENE.

Amputation, iii. H-2. Long, deep incis.
with knife and thermo-caut.; subl. sol.
(1–1000), appl. freely, then naphthol cam-
phor in sol. and salol oint. loc.; intern.,
naphthol and bism. salicyl., alcohol. stim.
and quin.—Irriga. subl. sol. to open wnd.
iii. M-19, 20. Open-wound treat. and anti-
sep. sol.; incis. with thermo-cautery;
intus.—If G. progresses, amputate unless
contra-indication. iii. M-20. Early incis.
with thermo-caut., free and deep, thorough,
const. appl. of antisep.: copious irriga.;
when amputation, leave stump freely open,
and treat in same vigorous way. Subli-
mate, ac. carbol., naphthol, hot water;
iodof., arristol, in oint. or powd., with fore-
going. Supporting treat. intern., alcohol,
quin., iron, salol, proper nourishment. iii.
M-21.

GENITO-URINARY DISEASES.

ANESTHESIA, LOCAL. If cocaine hydrochlor.
ineffic., prepare sol. as fol.: Arg. nitr., gr.
xv (1.0 grm.); coc. mur., 3ss (2.0 grms.);
dissolve each in aq. destill.. 3iiss (10 grms.);
mix sols.; use filtrate (cocaine nitrate).
v. A-39.

GESTATION, ECTOPIC.

Abdom. section before rupture, ii. G-8. *If*
rupture, op. as soon as evid. of int. haem.;
if viability reached without rupture, let
pregn. go to term, und. careful watching. In
all cases remove append. from both sides,
if possible.—Olshausen's method.—Electrolysis or abd. sec. 1. *If* diagn. bef. twelfth
week, and before rupture, use electr. 2. *If*
rupture occur and indications of arrested
haem., wait for react. and do laparot. 3.
If haemor. continues, do laparotomy, and
ligate vessels in broad lignt. 4. *If* fetus
is dead, and threatens danger, rem. at once.
ii. G-9. Electr. (galv. or farad.). ii. G-10.
Laparo-kelyphotomy and laparo-kelyphoe-
tomy. Ectopotomy. Disinfect. of sac with
sol. zinc chlor. (10%); treat intra-perit. ii.
G-13.

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Gums, surgical diseases.....iii. K- 35 fistula.....iii. K- 40 gingivitis.....iii. K- 35 herpes zoster— <i>zona</i>iii. K- 36 pyorrhoea alveolaris.....ii. K- 37	PYORRHŒA ALVEOLARIS. Local antiseptics, espec. <i>subl.</i> ; thermo- or galvano-cautery to combat arthritic element; constita. treat.— <i>If dark-blue color of swollen or spongy gums</i> , lance; then inject <i>ac. sulph. aromat.</i> (full strength). <i>If suppura.</i> imminent or present: incise; inject <i>hydrogen peroxide</i> sol. by delicate appl. of caustic paste (<i>potass. sum.</i> 2 pts.; <i>ac. carbol.</i> cryst., 1 pt.). <i>If cherry-red and slightly puffed</i> : sat. <i>sol. ac. salicyl.</i> in <i>alcohol</i> (95%). <i>If warm pink color, no increased size</i> : paste of <i>ac. tannic</i> and <i>glycerin</i> . Antiseptic mouth-washes of <i>sublimate</i> (1-1921), <i>hydronaphthol</i> (1-32), <i>hydrogen peroxide</i> .—Fix and immobilize teeth to prevent irreg. and elonga. iii. K-39.	GYNAECOLOGY— <i>Electricity in</i> : Mundé, Palmer, Sprague, Hayd, Graydon, Hobart, Smart, Hall, ii. F-56. <i>New Drugs in</i> : Freund, Reitmann, Schövaner, ii. F-56; von Swiecicki, Gaudin, ii. F-57.
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- HEMATURIA.**
If from kidney: extirpation of kidney, i. G-23. *If from increased pressure in renal capillaries:* laxatives, vapor baths ev. few d., i. G-24. *If from senile varicose veins of blad.:* tinc. cardus marianus, 3ss (2.0 grms.) t. i. d.—With cystitis: apply to dist. end of cath. the reversed bulb of ord. bulb-syr. to prod. suction. i. G-25. *Malarial:* quin. in large dos.; precede quin. by calomel. i. G-32. *Quinine,* i. L-10.
- Hæmoptysis.**
In elderly arthritic cases: diet, quiet, restrict liquids, still the cough, calomel, salines, alkalies with pot. iod., and freq. renewed counter-irritation; colchicum.—*Ergot inferior toaconite.* i. A-64. *Hydrastinine and sclerotic acid,* v. A-50.
- HEMORRHAGE.**
ARTERIAL. Temporary transfixion ligature. Curved needle, silk thread; through the skin, under the vessel, and out again as near point of entrance as poss.; tie thread around all the inclosed tiss. tightly enough to arrest puls. or bleeding: cut, leave from 1-24 hrs. [Unsurgical.—ED.] Lateral lig. when not more than one-half the circumfer. of vessel involved; cut off current by press.; expose artery, suture outer and middle coats, tie, cut off short; sheath, fasciae, and overlying tiss. sowed separately. Continuous suture in longitud. wnds. of art.; rigid asepsis, finest silk, contin. sut., engage only out. and mid. coats of vessel. iii. J-18. *Antipyrin, thallin, antiæbrin, phenacetin,* v. A-48. Medicated inhalation, v. A-83.
- EXPECTED.** Avoid use of alcohol, v. A-3.
- HEMORRHOIDS.**
Rectal douche, i. D-15. *Antiseptic; suppos.* v. A-13, 57.
- HARE-LIP.**
Israel's meth.—Thiersch's meth.—Use similar flap with grafted surf. inward; complete op. at 2 sittings. iii. H-36.
- HAY FEVER.**
Ac. carbon. gas, douches loo. for $\frac{1}{2}$ hr. t. i. d.; if severe, by rectum, in 6 qt. (litre) doses, m. and ev.—Cream as emol., iv. D-13. Reside in exempt local. bef. sympt. app.; stay until date when all sympt. should disapp.—*If nose is diseased:* surg. treat.; *if from morbid processes elsewhere:* loo. soothing, alter. appl. iv. D-14. Hollow glyco-gelatin med. cyl. inserted on hollow oval vulc. plugs, iv. D-34. *Euphorbia pilulifera,* v. A-46.
- ASTHMA.** Insuffl. cocaine powd (5¢-20¢) with starch, iv. D-34. *Ext. euphorbia pilulifera Ad., $\frac{1}{2}$ -1 teasp. ev. 4 h., v. A-46.* Banff, on Canad. Pacif. R. R., v. D-20.
- HEART, DISEASES.**
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- FATTY HEART.** Elder (*Sambucus nigra*), if digitalis disagrees, v. A-45. Naregamin, v. A-101. Nitro-glycerin; action irregular and feeble; drop of a 1-per-cent. solution gave immediate relief. v. A-104.
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- IN CHILDREN.** St. Moritz, in the Alps, v. D-23.
- OVERSTRAIN, ACUTE.** Absol. rest, nourishing food. Morphine and hot poultice if severe card. pain. i. B-17.
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- HEART, DISEASES (continued).**
- VALVULAR DISEASE.** Massage of heart.—Cauterization, i. B-12. If rise of temp., with pain, tenderness, and tension of vessels: rest, mild depletion, merc., sol. by absorbents, counter-irritat., etc. If no ar. sympt.: light grad. exercise, diet, avoid fat-tissue and plethora. Keep bowels reg.; occas. blue pill, sol. by saline. Iron, ol. morrh.—In young: pot. iod., merc. bichlor.—If hrt. is excited and strong: aconite, verat. vir., bromides. If anemic: iron and bromide. If wk. hrt.: digitalis, gtt. r increased. i. B-36. Convallaria, caffeine, strophan., Hoffman's anod., or nitrates; rest in bed. i. B-36.
- WEAK HEART.** Digitalis in increasing doses: if not well borne, try strophanthus. Strychnine to physiolog. effect. i. B-37. Cocaine, gr. 1-6 (0.01 grm.) t.i.d., incr. to gr. j (0.063 grm.), with wine. Diminish liquids; physical exercise. i. B-38. *In us. digitalis.*—Convallaria, gr. 1-6 to ss (0.01-0.03 grm.). Tinct. strophan., 3-20 drops t.i.d.—Adonidine, gr. 1-6 to $\frac{1}{2}$ (0.01-0.02 grm.) in 24 hrs. Caffeine, gr. xv-xxx (1.0-2.0 grms.). i. B-39. Sparicine sulph., gr. $\frac{1}{2}$ -iv (0.03-0.25 grm.). *Cactus grandifl.*, cornifltn. i. B-40. Massage of heart, i. B-42. Hemoglobin, v. A-48. Blue mass with digitalis and sulphate of cinchon., 22 gr. j (0.063 grm.) in pill, t.i.d., with diet and hygiene, v. A-94.
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- VERMIFORM APPENDIX, IN THE RIGHT FEMORAL CANAL.** Ice-bag to tumor. Soap enema to empty bowels. Herniotomy. V. A. isolated and ligatured with thick catgut passed through it and tied very tightly with Staffordshire knot. Part bel. lig. removed; sac dissected out. Counter-opening in outer flap; drainage-tube from wnd. through it; orig. incis. closed with silv. sut. iii. C-63.
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THERAPEUSIS.

- INFLUENZA (continued).**
gr. 1-6 (0.01 grm.), with sod. bicarb.; M. Spray of rini spicul, and pulc. Dos. at bedtime.—Quin. and ton., meat and wine prep. after ac. stage.—Quin., exalgia.—Analgia.—If nerv. prostra.: alcoh. and quin.; in bad cases: inject. of caffeine and ether.—In neuralgic or rheumatoid form: antipyr., gr. xv (1.0 grm.) with sod. bicarb. gr. viii (0.5 grm.) ev. 4 h.; or phenacetin or salol., gr. viij (0.45 grm.).—Whisky for prostration and digitates for wk. hrt.—Electricity for pains (30 or 40 Leclanché cells). i. A-60. In cases with high fever: tinct. catal/pur. 3ij (8.0 grms.) ev. 1-3 hrs., v. A-29. Ether, inject., v. A-46. Methacetin, v. A-96. Phenacetin, v. A-120.
- CATARRHAL FORM.** Quin., gr. iv (0.25 grm.) m. and ev., alone or with antipyr., gr. xv (1.0 grm.).—Aconite.—Stim. may be req.—If pulm. complica., card. tonic, caffeine. (See PULMONARY AND LARYNGEAL COMPLICATIONS).—Creolin sol. (10%) inhala. i. H-32. Pilocarp. inject.; if fever: cold sponging, affusion, cold pack or bath; Antipyr., anti/cbr.—Tinct. strophan., Ml i-v (0.07-0.33 grm.), with milk and cognac; in grave cases: oxygen inhala. strychn. hypod.—Quin.—Diaphoresis by pilocarp. and morphine. i. H-31.
- GASTRO-INTESTINAL FORM.** Absol. rest, recumb. post.; op. or parergo.—Bism. subnit. gr. x (0.65 grm.), ac. carbol., gr. iss (0.10 grm.), in caps., ev. 2, 3 or 4 h. Creolin, gr. 1-6 (0.01 grm.) ev. 2 h. i. H-32. In begin., pat. in bed, mercur. sol. by saline; light, easily-digest. diet; maintain secretions. i. H-30.
- NEURALGIC OR PAINFUL FORM.** Antithermic analgesics. Antipyr.; exalgia; phenacetin, gr. xv (1.0 grm.) 2 t. d.—For rachinalgia and cephalal.: blister to nucha.—Salicin, gr. xx-xi (1.30-2.60 grms.) ev. h. for 3-6 h., i. H-32. Antipyr., Quin. in convalesc., i. H-30. Faradic brush, wk. stable curr. grad. incr. for $\frac{1}{2}$ -2 min.; 8-30 séances. i. H-33.
- COMPLICATIONS.**
- AURAL.** Suppurative otitis med.: Open mastoid cells to evac. pus. i. H-24. Infla. of tymp., gargles, inhala., insuffia., antipyr., phenac., quin.—In eruditive form, when severe pain: bleeding in tempor. reg.; ice-bags behind or around ear; in some cases, iod. loc. to mastoid. Subseq., if paracentesis impossible: warm instil. into ext. aud. can. hourly. If pain incr. and temp. rise, and exuda. in mil. ear, with mastoid pain and sensitiv.: do paracent.; then infla., syr. can. with antisep. sol.; pack with gauze; remove subseq. secre. with cott.; avoid insuffia. of powd. in ac. perf. cases. i. H-33.
- CARDIAC.** Syncope: Inject ether, i. H-32.
- CEREBRAL ABSCESS.** Open mast. cells, evac. pus in cells and in abscess (occip. lobe). i. H-19.
- GANGRENE OF LEG.** Eleva. and occlus. dress.: finally, amputa. i. H-25.
- LARYNGEAL.** Sprays of ac. carbol., cocaine, ac. horic, resorcin. i. H-32, 33.
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- PAROTIDITIS, PURULENT.** Deep incis.; if suffoca. from edema laryngis: tracheot. and artific. respira., i. H-28.
- PSEUDO-RHEUMATISM.** Rest, wrap in cott., sod. salicyl., antipyr., i. H-26.
- PSYCHOSES.** Watch conval.; combat signs of mental aberra. with stim. and restoratives. i. H-15.
- PULMONARY.** Ammon. chlor., gr. x (0.65 grm.), apomorph. mur., gr. I-12 (0.005 grm.); mist. glycyrr. comp., syr., $\frac{1}{2}$ 3ss (4.0 grms.). M. Sig.: Ev. 2 or 3 h. i. H-31. Card. tonic treat. Caffeine, gr. v (0.32 grm.), 2 or 3 t. d.—Blister to chest.—Convalescence in country. i. H-32. If bronchitis: terpine and bals. Tolu., $\frac{1}{2}$ gr. ias (0.10 grm.) 6 or 8 t. d.; or in pill, with tar and sod. benzoat. i. H-33.

AUTHORS QUOTED.

- INFLUENZA**—Clemow, Heyfelder, Medical Press and Circular, Buckingham, Guitéras, Medical Record, i. A-55; O Correio Medico, Medical Record, Therapeutic Gazette, Dowd, Fraenkel and Weichselbaum, Finkler, Levy, Prudden, Ribbert, i. A-56; Trudeau, Armstrong, D'Hoste, Bouchard, Medical Press and Circular, i. A-57; Shattuck, Guitéras, Pepper, Chappelle, Hayem, Huchard, i. A-58; Fernet, Gautrelet, Chapelle, Fox, Grasset, Rousseau, Ranzier, Money, Williamson, Eitelberg, i. A-59; Urbantschitsch, Schwimmer, Childs, Medical Press and Circular, Therapeutic Gazette, Dujardin-Beaumetz, Huchard, Guitéras, Worthington, i. A-60; ANNUAL 1890. La Semaine Médicale, Boston Medical and Surgical Journal, i. H-1; Heyfelder, New Zealand Medical Journal, Australian Medical Journal, i. H-2; Colleville, Maurel, Debrun, i. H-3; Ucke, Kowalski, Leyden, Greenley, Mitchel and Buchan, Osler, Otrema, Fürbringer and Tibbles, Colleville, i. H-4; Otrema, Tibbles, Proust, Anthony, i. H-5; Lotz, Osler, Straub, Pribram, Kirn, Combe, i. H-6; Kowalski, Bäumer, Kirn, i. H-7; Prudden, Fraenkel and Weichselbaum, i. H-8; Prudden, Marmorek, Gram, Fraenkel - Weichselbaum, i. H-9; Ribbert, Marmorek, Fraenkel, Weichselbaum, Levy, Babes, Kowalski, i. H-10, Babes, Gram, Kowalski, Laveran-Dowd, Finkler, Levy, i. H-11; Klebe-Ehrlich, Kollman, Leyden, Marmorek, Weichselbaum, Laveran, i. H-12; Du, flocq, Bäumer, Axel Ulrik, Da Costa, i. H-13; Leyden, Sokolowski, Kahler, i. H-14; Nothnagel, Lublinski, Mispelbaum, Kraepelin, i. H-15; Mispelbaum-Van Deventer, Helweg, Paine, Kern, i. H-16; Pick, Crichton-Browne, Bloq. Holst, Müller, Onodi, i. H-17; Bernhardt, Kleckowski, Heyman, Hersfeld-Inglott, Churchhouse, i. H-18; Colley, Holt, Erlenmeyer, Aczel, Hoffman, Fox, i. H-19; Fox, De Brun, i. H-20; Herzog, Fleisinger, Remak, Henoch, Eisenlohr, Krakauer, Nothnagel, i. H-21; Frankl, Hochwart, Westphalen, Joffroy, Fukal-Bergmeister, Gillet de Grandmont, i. H-22; Bernhardt, Senator, Saundby, Haug, Dreyfuss and Schwabach, Glover, Gruber, i. H-23; Politzer, Chatelier, Peter, Wilks, Aufrecht, Tisne, Röhring, Haushalter, i. H-24; Surmont, Cross, Burghard, Matlakowski, Loison, i. H-25, Loison, Rheiner, Olivier, Troost, Leyden, i. H-26; Mosler, Ewald, Meissner-Landgraf, Schwimmer, Fuchs, Kahler, i. H-27; Loestalot, Ewald, Moser, Bacelli, Bennett, Comby, i. H-28; Meyer, Cameron, Luow, i. H-29; C. Graeber, Eichhorst, Tranjen, Duboy, i. H-30; Eichhorst, Giovanni, Nothnagel, Gellie, Wood, i. H-31; Dujardin-Beaumetz, Peter, MacLagan, Rabener, Mouré, i. H-32; Gendre, Haug, Nothnagel, i. H-33; Anon., v. E-34.
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Insomnia.ii. D- 30	INSOMNIA. Give hypnot. drugs rarely, only as last resource; use small dose, repeating if necess.; be satisfied with least amt. of sleep that is safe, if produced by med.; avoid drugs, as a rule, except for euthana- sia, when mental condit. prevents after- effects being noted; hypnotics may increase wakefulness; look for unpleasant or toxic results when drug is given in suffic. dose to prod. prolonged and prof. sleep; give large dose when indicated; effects or tolerance in sensitive private pat. not the same as in hospital pat.—Avoid routine prescribing. ii. D-30. <i>Amylene hydrate</i> , v. A-7. <i>Butyl</i> <i>chloral hydrate</i> , gr. v. (0.33 grm.) in pill ev. 2 hrs., ad gr. xxx (2.0 grms.), v. A-21. <i>Cannabis Indica</i> , <i>salty ext.</i> , v. A-26. <i>Chloralamid</i> , gr. xv-xlv (1.0-3.0 grms.) in sol. or caps., v. A-30. 31. <i>Hyoscine hydro- brom.</i> , v. A-54. <i>Hypnal</i> , gr. xv (1.0 grm.). <i>Hypnone</i> , gr. iii-viia (0.20-0.50 grm.) in caps. or ol. <i>amyg. dulc.</i> , v. A-55, 56. v. A-57. <i>Hypnotism</i> , v. A-61. Where baths cannot be supplied to produce sleep, apply cloths soaked in warm water over the belly and lumbar region; then cover with oiled silk or rubber cloth, to prevent evap. <i>Massage</i> , v. A-82. <i>Paraldehyd</i> , M ₁ x-x ₀ (4 to 6 grms.), v. A-117. <i>Phenaretin</i> , v. A-120. <i>Somnal</i> , M ₁ xx-xxx (1.30 to 2 grms.). v. 130. <i>Sulphonal</i> , v. A-131. <i>Urethan</i> , v. A-135.	INTESTINAL ABSORPTION, INFLUENCE OF DRUGS ON — Küvshinsky (ANNUAL 1890), Leubuscher, v. B-56.
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THERAPEUTIS.

LABOR.

ANÆSTHETICS. Chlorof. and ether, ii. J-4. To prevent post-part. hemm.: ergotin hypod. and manual compress. of ut. Chlorof. in severe L. and ordin. oper.; ether, by means of Clover's inhaler, in long and severe oper., espec. when much loss of bld.; two physic. present when anæsth. given. ii. J-5. *Chlorof. sudorifici*: In nerv. excit. of primip. and where L. is prolonged; in spasm, contract., or rigid neck or body of ut.; *Contra-indications*: Absence of sev. suff., placenta prævia, genit. prostra., dis. of circula. or respira., cerebr. dis., alcoholism, etc.—*Pure chlorof.*; sm. quant.; pat. in horiz. posit; interval betw. successive inhala.—*Antipyr.*, gr. iv. (0.25 grm.) hypod.—Mixtures of ether, chlorof., chloral.—*Sol. cocaine mur.* (1%) loc.—Hypnotism in hyster. pat.—*Morph.* in first stage; chlorof. in second stage; nothing in third stage. ii. J-7. *Chloral* in prolonged first stage, in doses of gr. xv. (1 grm.), repeat in 20 min., by mouth or rectum; a third dose may occa. be req., but never more. ii. J-8. *A. C. E.* mixt.—*Antipyr.* in painful complications (ut. contract. with exag. pain.; post. posit. of vertex; premat. rupt. of membr.; spasm. contract. of cervix, etc.); useful in after-pains, espec. when caused by ergot, except in retent. of secundines or clot, then empty ut., give hot irriga., fol. by *antipyr.* ii. J-9. *Antipyrin*, v. A-11. *Mistletoe*, v. A-93. *Acetanilid*, v. A-1.

ANTISEPTICS. Order of strength: Sublimate, cupr. sulph. and ac. carbol. sol. by merr. biniod., patens. permang. To obtain perf. antisept. cond., give ut. inject. immed. after L., vag. inject. insuff. Horse-hair mattresses without beds; sterilized only when case runs unsav. course. Vag. irriga., use sol. subl. (1-2000) for first 3 or 4 d.—*Fluocilicate of mnl.* (infer. to subl.). ii. J-1. *Private practice*: Always wash hands in sol. subl. (1-1000) bef. exam.; subl. glycer. (1-1000) for lubrica. hands; in norm. cases, one post-part. vag. irriga. with sol. subl. (1-2000) suffic.; but carbol. irriga. (2 1/2, 5%) throughout puerperium. If grave obstet. manip. or fever: use vag. irriga. (1-2000) for at least 4 d.; disinfect. of hands of phys. and midwife. ii. J-2. *Hospital practice*: Give pat. full bath on admiss.; rectal inject.; scrub with soap and wat. lower abd., inner surf. of thighs, anus, and groins, then with sol. subl. (1-1000); vag. douche of soap and wat. fol. by subl. sol. (1-4000). In op. cases, repeat douche bef. and aft. introd. of insta. or hands; internes not to visit contag. cases or places, while on duty: internes and nurses req. to wash hands and arms as far as elbow with s. and w., then plain wat., then with subl. sol. (1-1000); infreq. exam.; insta. washed in carbol. sol. (2%), boiled, then polished, after using; placenta expelled by Crede's meth., and ergot; vag. douche subl. sol. (1-5000), and, if high-forceps op. or version, carry douche into ut. cav.; ii. J-3; external parts, idof. dusting, cov. with ganze wrung from subl. sol. (1-5000), then oakum pad, changed ev. 6 h., and ext. gen. cleansed at same time.—No vag. douche dur. L.: mild current. ii. J-4. Oakum pad in priv. prac., destroy after using; good laundry work. Phys. should avoid ac. infect. dis., as erysip. or diphth., when caring for obstet. cases. In true puerp. fever, freq. douche had unless clots or for. bod. in ut. cav.—Intra-ut. irriga., use sol. subl. (1-3000); inject slowly; ut. should contract well. ii. J-4.

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1st Col.—Ma to Mo.
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- DYSMENORRHÖEA.** **In school-girls:** Keep
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nervous, longer. Calisthenics. Unspun-
wool underwear (Jaro wear). If any pain:
keep bed during menstr. per. ii. F-11.
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menstr. Chloroform, gtt. x on sugar ev.
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 peated; *atropia* iner. to gr. 1-2 (0.0034
 gramme), aided by artific. respir. and hot
 applications. *Atrop. inject.* rep.—Stomach-
 pump; hot water. Hot blk. cuff.; 3 injects.
Atrop. sulph., gr. 1-3 (0.0021 grm.), rep.
 3 t., at interv. of $\frac{1}{2}$ h.; artific. resp. v.
 A-109.—Farad. in inst.—*Atrop.*, gr. 1-3
 (0.002 grm.). v. A-110. Emetics. v. A-111.
- MORPHINISM.**
 Sudden withdrawal. iv. I-12. *Milligan's*
 method: Rapid withdrawal modified by pro-
 long. isolation by full and iner. doses of sod.
bromide, gr. xxx (2 grms.) 2 t. d. iner. gr.
 xx (1.3 grms.) a day until in 8 or 10 d. pat.
 takes gr. o-xx (6.65-8.00 grms.) doses;
 during bromal medica., op. grad. reduced,
 on 8-10 d. entirely abandoned; reduct. of
 1- $\frac{1}{2}$ per d. at first; on last d. of using op.
 give full dose of morph. at bed-time to
 secure sleep. Meet reflex sympt. quin.,
 gr. xx (1.3 grms.), fol. by ext. coce Ad.,
 tablesp. ev. 2 h. or ext. *cannabis Indica Ad.*
 (Squibb's), tablesp. ev. 2 h. Hot baths,
 cold douches. For neuralgia: electr., ether-
 spray, hot water; *antipyr.*, *acetanilid*,
phenac., *exalgia*, *croton-chloral*, *tonga*,
menthol loc. carb. *bisulph.*, *camph.* and
chloral combined; 24 hrs. after final with-
 dr. of op., put pat. in bed for 2-4 d.—No
 restrict. in diet unless necess.—If nausea:
 rest, liq. ralc. and milk, malted milk, ice.
bism., *chloroform*, faradism, sinapsins; or
 if necess. a full dose of op. hypod.—For
 debility: ext. *cocci Ad.*, tensp. 3 or 4 t. d.
 (cocaine is unsafe for self use). For insom-
 nia: *cannabis Ind.*, *chloral*, *bromides*, *sul-*
phonal and allied hypnotics; sometimes
 hot bath, light meal, hot glass of milk or
 electric. will suffice. Cheerful surround.,
 occupa., freed. from worry for long time.
 Dismiss pat. if able to sleep each night for
 1 wk. without hypnotic. iv. I-13, 14.
Lanpheur's method: Withdraw morph. in
 7-10 d. For insomnia: *sulphonal*, gr. xx
 (1.3 grms.); *camphor monobrom.*, gr. iv
 (0.25 grm.); rep. if necess.; reduce and
 finally supersede by ammon. *bromid.*; for
 delirium: *hyoscine hydrobrom.*, gr. 1-00
 (0.0018 grm.); for diarrhoea: *bism. salicyl.*
 and *cocaine sulph.*; for cramps: *antipyr.*,
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Benefit nutrition by dilat. vessels, ii. C-76. Avoid excess of starches and sugars; use fats and phosphates. Change or transfer of locality. Absol. rest and isolat. baths and exercise. *Arni l alcohol*, opium, bromides, ii. C-81. Electr., galv. and farad., v. C-1.
REFLEX. Remove cause, ii. C-79.

AUTHORS QUOTED.

NERVOUS SYSTEM, ANATOMY—Schütt, Goldberg, Obersteiner, v. G-15; Frazer, v. G-25; Eberstaller, v. G-15; Obersteiner, D. J. Cunningham, British Med. Jour., v. G-16; Cunningham, Ramon y Cayal, Borgherini, v. G-17; H. J. Mulford, Perlia, Schiller, Forel, P. D. Koch, John Ferguson, v. G-18; Dana, Jour. of Nervous and Mental Disease, v. G-19; Lajara, v. G-23.
NERVOUS SYSTEM, PHYSIOLOGY—Roy and Sherrington, v. H-13, 14; Mall, v. H-14; DeBosch and Verhogen, Roy and Sherrington, Marcy, V. Koranyi, Golta, Mott and Schäfer, v. H-15; Thompson and Brown, v. H-16; Schäfer and Brown, Ferrier, Claude Bernard, Schiff, Wertheimer, v. H-17; Bowditch, Rolleston, Callendar, v. H-18; Bowditch and Warren, v. H-19; Weir-Mitchell, Reichert, Waller, v. H-20; Waller, v. H-21.
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- OBSTETRICS**—William H. Parish, ii. J-1.
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IDIOPATHIC.	Salines or enemata, to keep bowels open; codex to relieve pain; ice-coil on abd., if fever; leeches; hot rectal and vag. douches 3 or 4 t. d.; if no improvement, do laparot.—Children with recurrent attacks should wear tight abdom. bandage.—Alonzo Clark's opium treat. If from fecal impaction: empty bowels first, rest afterw. On 2d or 3d d., purgat. dangerous, iii. C-9. If plastic deposits present: ice-coil harmful. iii. C-10. Remove cause, if possible. <i>First stage:</i> Depletion, genl. and local blood-letting, saline purg., op. to relieve pain. <i>Second, or exudative stage:</i> Absorbents, merc. loc., calomel with belladon., and op. <i>Third, or stage of resolution:</i> Support. If suppuration: open abd., antisep. lavage, drain. iii. C-14. If post-peritoneal thickening: electrol., v. C-12.	
PERFORATIVE.	If diffuse, septic P., open p. cav. freely; find and close perf.; disinfect. iii. C-11. <i>Progressive fibro-purulent P.:</i> Op. contra-indicated; do not disturb adheses; evac. each intra-perit. abscess separately. In cases of doubt, make explor. puncture. Free incis. into abd. wall where abscess most prom.; wash out cav.; pack with <i>iodof.</i> gauze; do not close by suture. iii. C-11.	
PUERPERAL.	Keep vag. and ut. clean. Salines; avoid opium.—If after operations: salines, fol. by op.; if shock: give large doses. iii. C-10.	
SUPPURATIVE.	Immed. laparot.; irrigation; drainage. iii. C-15.	
TUBERCULOUS.	Abdom. incision; lavage with sterilized boiled water. iii. C-12. Remove tubercles bef. peritonitis develops, iii. C-13. Removal of fluid, iii. C-15.	
TUBERCULAR.	If rest in bed, suitable diet, etc., do not improve pat., operate. i. D-20. 21. Laparot. better than puncture and irriga.—Abdom. irriga. with puncture, without laparot., has been successful. i. D-22.	
PERTUSSIS.	Pull lower jaw downward and forward during parox.—Resorcin to pharynx and vestibule of larynx. Chloral, large doses.—Balsams, when cough bec. non-convulsive.—Belladonna; insuffla. of <i>poicd.</i> <i>roasted coffee</i> and quin., mixed; inhala. <i>sod.</i> <i>benzoate</i> ; antipyr., gr. 1-100 (0.0006 grm.) per month of patient's life. i. J-31. Resorcin, gr. iii-xxij (0.19-1.42 grms.), accord. to age, and ev. 1 or 2 hrs. accord. to intensity of dis.—Hydrate of turpentine (<i>terpene hydrate</i>), gr. xx-xlv (1.30-3.0 grms.), as to age.—Antipyr.—Chloral.—Ergot.—Ouanabane. i. J-32. Sulphur vapor; Deschien's candle, No. 1, night and morn.—Bromo., gtt. ii-lij (up to 1 yr.); gtt. iii-iv (2-4 yrs.); gtt. iv-vj (5-8 yrs.) t.i.d.; incr. dose on 3d d. by add. gtt. j to orig. dose; given in a teasp. of water.—Antipyr., gr. iss (0.10 grm.) for ev. yr. of child's age, t.i.d. i. J-33. Acetanilid, v. A-1. Antipyrin, v. A-12.	
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 Pressure, for pain.—Antisept. inject. in purul. cases.—*Sod. chloride*, gr. viii (0.5 grm.) in aq., tab'esp. ev. 2 h.—*Syr. ferri et mangani*, co. and *syr. ferri und.* in stationary exudative P.—*Syr. ac. hydriod*.—Aspira. with trocar; if a little dry cough fol. by spasm. effort, withdraw trocar. i. A-11. Open-air, in post-op. pat.; if disch. small: dumb-bell exer.—In serous exuda.: use *sod. salicyl.*, gr. xv (1.0 grm.); on 1st d. give 4-6 dos.; for 8-10 subseq. d. give 3 or 4 dos. per day.—*Sod. salicyl.*, gr. viii-xij (0.52-0.78 grm.) daily.—Intra-pleur. inject. *merc. bichlor.* i. A-12. (See also EMPYEMA, i. A-55; iii. B-10.) *Eth. tinct. capsici*, ext., loc., for pleurodynia, v. A-28. *Chloral-amid*, for insomnia, v. A-31. *Codine*, gr. ss.- $\frac{1}{4}$ (0.03-0.05 grm.), 5 t. d., v. A-42. *Methacetin*, v. A-96.
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Plumbi acet., gr. vi-xv (0.40-1.00 grm.) in 24 hrs., in vigor subj., bloody sputa; in debil. and broken-down persons, alcoholics and diabetics.—Mustard-leaves and cott., and oil-silk jacket; check chill by 2 doses *nitro-glycerin*, gr. I-100 (0.00065 grm.); ammon. carb., fol. by alcohol.—Bleeding, viii-xvj (230-500 grms.).—*Pot. citr.*, gr. xxx (2.0 grms.), with *pot. nitrus*, gr. v. (0.32 grm.) ev. 2 h.; rub chest with ungt. *thapsiae* (15% in oleite). i. A-6.—Sustain hrt. and nerve-force. *Chloral* and *digital.* in freq. rep. dos., in alcoholic delirium. *Tinct. capsici*, in alcoholics.—Inhala. of *chloro.* (may be mixed with alcohol).—*Ergot*.—*Ergot* and *tinct. gelserm*.—*Oxygen*.—Pulmonary phlebotomy (aspira. needle into lung).—Tracheal inject. *sol. naphthal* (1-50). i. A-7. *Antiseprin*, viii (0.50 grm.), v. A-13. When scant secretion: *tinct. catalpa*, 3lj (8.0 grms.) ev. 1-3 hrs., v. A-29. *Extr. cocainum jdl.*, gtt. x-xv ev. 3 or 4 hrs. in broncho-pneumo. v. A-40. *Codine*, gr. ss.- $\frac{1}{4}$ (0.03-0.05 grm.) 5 t. d., v. A-42. *Cresantinic acid*, v. A-44. *Methacetin*, v. A-95. *Naregamia*, v. A-101. *Nitro-glycerin*, v. A-104. *Orthin*, v. A-115. *Oxygen*, v. A-117. *Phenacetin*, v. A-121.
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- GONORRHEAL.** *Phenacetin*, gr. xv (1 grm.) t.i.d., incr. to 6 or 8 t. d., with compression of joints.—*Pot. iod.* and compress'n.—*Mercur. vint.*—Remove urethral strictures.—Rest, immobility, vesication or thermo cau. in early stage, fol. by massage later; intern. med. useless unless syph. is present, i. K-8.
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- ACUTE (CORYZA).** *Tinct. euphrasiae*, gtt. x dos.—*Ammon. carb.*, in tol. large dos., freq. repeated.—Inhala. *ol. eucalyptu* used early; if odor is objectionable, use *ol. menth. pip.*, 1 pt.; *ol. eucalyp.*, 2 pts.; M.—*Creolin*, in dil. emuls. with *aq. dentil*, inspired directly.—*Cocaine*: Sprays or powd. not to be contin. after the first few d. of attack; not to be used in chrt. cases; powd. dispensed by phys., not over 3j (40 grms.) to each pat.; use sol. as snuff: *menthol*, gr. j (0.07 grm.); *ext. biorb.*, gr. jj (0.14 grm.); *magnes. carb. lev.*, gr. iii (0.20 grm.); *cocain. hydrochlor.*, gr. iv. (1.25 grm.); *menth. laetitia*, 3iss (6.0 grms.); M. iv. D-4. *Pulo. naph.*, *pulo. ac. borri.*, 22 3vj (24.0 grms.); *pulo. camph.*, *ext. violae*, 22 gr. xv (1.0 grm.); *ess. roses*, gtt. x; M.—*Iodof. insuffia*.—*Ac. salicyl.*, 4 pts.; *ac. tunicae*, 6 pts., *bism. subnit.*, 90 pts.; M. iv. D-5.—*Menthol spray* (10% -20% sol. in oil).—Inhala. *menthol* cryst. iv. D-34. *Ac. trichloroacetic*, iv. D-36. *Pulo. auramin* (1%-2%), as snuff. v. A-9.
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- HYPERTROPHIC.** Galv. caut. *Ac. chromic*, iv. D-34. After appl. of cautery, rub caut. patches with *pyoc.*—Cott. moist. in *pyoc. sol.* (1-500), apply on nasal probe; after removal of eschar, *pyoc. sol.* to wnd.; plug cav. for 2 hrs. with *pyoc.* cott.; later apply ev. $\frac{1}{2}$ hr., salve of *lanolin*, 5vj (23 grms.); *liq. paraff.*, gr. lxxv (5 grms.); *rose-oil*, gtt j; M.—Contin. treat. with *pyoc.* daily for 6 d.; then on altern. days; then insuff. of powd. of eq. pts. of *ac. borri.* and *polass. sozinadol* to dimin. secre. iv. D-35. *Ac. trichloroacetic*, iv. D-35. Palmer's speculum.—Myles's speculum.—Flatau's retention appar. for Voltolini's speculum.—Dioniso's compression method. iv. D-37. Mineral Springs of Arima, in Japan, v. D-28. *Electrol.*, v. C-29.
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- RETROPERITONEAL FATTY TUMOR**—Homann, Cabot, iii. C-6; Richardson, Homann, iii. C-7.

- RHEUMATISM**—Hugh Lane, i. K-6; Charles H. Shepard, Robert Bell, A. Haig, i. K-1; Jacoud, Petrone and Mantle, ANNUAL 1889 and 1890, F. Bordas, G. See, House, Friedlander, Fehleisen, Barlow, Gerster, Robert T. Morris, i. K-2; A. Haig, Bell, Jacoud, Bordas, House, Gerster, Morris, A. Ollivier, Peter, Frank S. Parsons, i. C-3; Kasouli, C. W. Suckling, William A. Edwards, A. D. Birchard, i. K-4; Barlow and Warner, W. Snively, i. K-5; H. W. Syers, C. J. Rademacher, i. K-6; Raphael Hirsch, V. Calab, Collischonn, A. Haig, W. A. Proctor, i. K-7; Aulde, Rifat, Schüller, Robert T. Morris, Peter, Carl Hochhalt, Coleman Korda, i. K-8; Hans Frelich, Charles H. Shepard, i. K-9.

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SCROTAL PNEUMOCYCLE. If benign, puncture if neces. If malignant, incis., drain., disinfect., and s. t. castration. iii. E-2.
SEASICKNESS.
Coca wine (Mariani), v. A-35. *Eucalyptus radiata*, gr. j (0.07 grm.), admin. in form of lozenges, 3 or 4 t.d., v. A-46.
SEBORRHOECA CAPITIS.
Hydroxylamin, alc. sol. or oint. (1/2%), iv. A-53. *Sulphur* in oil (1-8), iv. A-53. *Glycerin*, esp., 90 pts.; *ac. salicyl.*, resorcin. albiss., 11/2 5 pts.; M. iv. A-57.
SEPSIS.
SEPTIC INTOXICATION. Attack infective force to prevent further infect.; stimulants, etc., to combat effects of poison. iii. M-23.
SEPTIC INFECTION (Progressive septic-sepsis). Prophylaxis. Surg. antisepsis.—Freely open and treat antisep. original wound, vigorous loc. treat., with stim. and anti-sept. intern. iii. M-24. *Calendula*, teasp. doses. v. A-24.
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ABSCESS. Puncture through m. m. of upper lip (sulcus gingivo-labialis), iv. D-19.
ATROPHY AND HYPERSTROPHY.
ATROPHY, WITHOUT DEVIATION. No partic. treat. iv. D-16.
HYPERTROPHY. If respira. interfered with, divide cartil. to bone with bistoury or thermo-caut.; if neces. to attack bony port., use bone-forceps in pref. to saw.—Galv.-caut. iv. D-16.
Cysts. Puncture.—No op. unless indication. iv. D-21.
DEVIATION. Asch's op., iv. D-16, 17, 18.—Files of var. shapes to rem. cartil.—Jarvis's mod. forceps.—Brown's insulated ring on cross-bar of caut. snare.—Brown's saw for dental engine or motor.—Electrol., monopolar pos. punct. and bipolar meth. iv. D-18. Jarvis's haemostatic compresso-rin. — Jarvis's antisept. crown-drill.—Veedor's forceps. iv. D-37.
HAEMATOMA. Rest in bd.; *crup. lot.* iv. D-20.
PERFORATION. *Ungt. hydrarg. nitrat.* dil. to edges of ulcera.; Mitchell's device (flanged pledget). iv. D-19.
SPURS. Do not remove unless decided indica.—Dental drill.—Galv.-caut. iv. D-20.
TUMORS. Excision.—Cold-wire loop. iv. D-20.
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SKIN, DISEASES.
 Arsenical waters of Levico, 1 or 2 tablesp. aft. meals, in chr. cases.—Aix-les-Bains and Marlioz, in France. v. D-27.
EPITHELIOMA CUTIS. *Aristol.* iv. A-49; v. A-16.
FIBROMATA. Electrol., v. C-27.
EDEMA CUTIS, CIRCUMSCRIBED. Treat. of little avail.—Saline aper. with sod. salicyl. iv. A-29.
TUBERCULOSIS. Electrol., v. C-27.
SMALL-POX (VARIOLA).
In grave cases (confluent eruption): give tepid baths, *corros. subl.*, 3j (30 grms.) to each bath. When mouth and pharynx the seat of erupt.: give antisept. gargles. Bathe eyes with tepid sat. sol. ac. boric. i. H-72. *Mercury*. v. A-86.
CICATRICES, PREVENTION OF. Ether. sol. of antisept. by spray; *solol* when *erup.* is slight and scanty; *in grave cases:* *corros. subl.* i. H-71. *Subl. ac. citric.*, 1/2 gr. xv (1.0 grm.); *alcohol.* (90%). 1/2 viii (0.50 grm.); *ether.*, q. s. ad. 3ss (50.0 c.c.m.); M. Use as spray 3 or 4 t. d. until desired. finished; use for 1 min.; protect eyes by cott. squeezed out of sat. sol. ac. boric.; in intervals apply *glycerine hydrarg. chlor.* *corros.* (1-15).—*Bad cases:* *subl.* baths.—*Ac. boric.* in *glycer.* (1-12) to *erup.*, with C. H. pencil, on face or in phar. Tepid sat. sol. ac. boric. to eyes. i. H-72. *Ac. boric.* in *glycer.* (1-12), v. A-20.
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THERAPEUSIS.

- Sycosis.
Depilate, apply *campho-phénique*. When
pust. cease to form: shave ev. morn., making
lather with *subl. soap*, using *sol. bi-*
chlor. (1-1000). Make razor, shaving-
brush, etc., aseptic. After shaving, apply
subl. sol. (1 or 2-1000). Same appl. at
night, occas. *substit. lanolin*. iv. A-38.
Saponated glycerin prepara., iv. A-57.
- COCCOGENIC.** If much infl. or eczema: luke-
warm poult. of antisep. starch-paste (*boric*
ac., 1 pt.; *starch-powd.*, 16 pts.), changed 3
t. d.; commence epila. and shaving as soon
as poss. Oint.: *Hydrarg. oleat.* (2%). 3ij
(31 grms.); *ichthyol sulph.-ammon.* M
xx (1.3 grms.); *ac. salicyl.* gr. x (0.65
grm.); *ol. lavand.*, gtt. ij.: M. Apply on
strip of linen dur. night, at least. iv.
A-38.
- SYPHILIS.**
- PROPHYLAXIS.** License of prostitutes, iii.
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- ABORTIVE TREATMENT.** Excision of chan-
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Excision. Thermo-caut.—Treat only when
symp. appear. iii. F-29. Treat from
beginning: innuncions; inject *hg. oleat.*; *hg. salicyl.* hypod.; intermittent innunct.
from appear. of secondary sympt. through
4 or 5 yrs.—Excision. *Leloir's meth.*; 2 or
3 wks. after appear. of second. les. *ungt. hg.*
3ss-j (2-4 grms.) daily by innunct. Rest 1 wk., renew innunct.; continue
treat. for 10 mos. iii. F-30. *Subl. baths*
(3ij—8 grms.) of *bichlor.* to bath, for
cutan. syphil., if multiple and rebellious.
After 10 mos. mere. innunct. for per. of
10 d., then rest 3 wks. to 2 mos. Purg.,
sudorifica, exercise. If pain or cephalal.:
pot. iod. and *ammon. brom.* In 2d year:
10-d. course of innunct. every 3 mos. In 3d
and 4th years, if no manifesta.: a 10-d.
course of innunct. twice a year.—*Kaposi's*
meth. iii. F-31.
- CONSTITUTIONAL TREATMENT.** *Kaposi's*
method. No specif. treat. till roscea ap-
pears. *Merrury and iodine.* *Ungt. hydrarg.*
by innunct., iii. F-31. *Gray oint.*, gr. xvij
(3.12 grms.) to ad.; gr. x (0.65 grm.) to
child. Innunct. by pat. himself. If *sativa-*
tion, stop treat. for 5 or 6 d., use mouth-
wash contain. few drops of *tinct. myrrhæ* or
tinct. krameria, keep mouth and teeth
clean.—*Empl. hydrarg.* for local ulcers.—
Sublimate baths, corros. *subl.*, 3iii-xij
grms. to each bath, soak sev'l. hrs. daily.
iii. F-32. Soluble mercur. salts, hypod.—
Calomel. *subl.*, *hydrarg.* profund., *pot.*
iod., *tinct. iodi*, by mouth. *Zitmann's*
dermat. in late forms. Bath cures of
iodine and *sulphur*. *Iodine* baths: Halle,
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circumscribed. No treat. till secondary
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treating primary lesions. iii. F-35. *Burret's*
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When dilatation of stomach in later
stages: mere. hypod., *iodeides* in milk by
rectum. *Cascara amarga*.—*Ipecac.* gr. $\frac{1}{2}$
(0.008 grm.), with *hydrarg. biniot.*, gr.
1-16 (0.004 grm.), in tablet: 9 to 12 daily. iii.
F-37. If erupt. from *iodeides*: hot baths
morn. and evng.—*Calomel* plaster. iii. F-
38. *Calomel*, gr. 4-5 (0.05 grm.), hypod.
Metal. merc. (gray oil) dangerous. *Hy-*
drarg. oxidi flur., gr. 3-5 (0.04 grm.) in
mucil. acaciae (1-120). *Hg. salicyl.* hypod.,
in secondaries and mild returns, 10-12
inject. in 20-40 d. iii. E-39. *Hydrarg.*
oxidi nigr. in pure *ol. oliva* for intra-musc.
inject. *Hydrarg. benzoat.*—*Hydrarg.*
thymol acetate, hypod.—*Cyanide sol.* (1-15),
M viiss (0.5 grm.) in muscles of thigh. iii.
F-40. *Cal. hypod.*—*Yell. oxids* every 10 d.
in series of 6 inject., separated by interv.
of wks. or mos.—*Hypoderm.* meth. only in
emergency. iii. F-41. Hot baths.—*Merrury*
baths in local syphilides. iii. F-42. Partial
baths. *Sublimat* electric baths. *Sul-*
chlor. and *iodine-brine* baths in intervals
of intermittent treat. *Sulphur* and salt

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TONGUE-LESIONS. *Secondary syphilitides*. *Ac. nitrate of merc.* loc., iii. F-19. Clean mouth, abstain from alcohol and tobacco. *Borax* and astring. mouth-washes. *Tertiary lesions*: *In guinmatous glossitis, potass. iodiide*; *in sclerous form*, *pot. iodi.* and *mercury combined*. As topical applica., *pot. iodi.*, *tinct. iodi*, $\frac{1}{2}$ 8 p., *aq.* 100 p. M.—Caustics only in sclerous form when fissures or rhagades: *when fissures*: *arg. nitr.*; *when rhagades*, *tinct. iodi* till eschar cast off, then dust on *arg. nitrate*. iii. F-20.
TACHYCARDIA.
Quin. in rather large dos. long continued. *Amyl nitrite*, i. B-27. *Digitalis*; *tinct. opii*; *brandy, ether*, and *ammonia*, i. B-28.
TAENIA (TAPE-WORM).
Kouzen (powd. flowers), 1 pt.; water, $7\frac{1}{2}$ pts. Mix. Infuse powder in hot water, allow to cool, give at one dose.—*Kousseo*, 3ss (16 grms.); sugar, 3j (32 grms.), in electuary.—“*Daraine's Kamala potion*”; *Tinct. kamala*, 3ss (6.0 grms.); *syr. aur. cort. amar.*, 3v (20.0 grms.); *aq. aromat.*, 3iv (120.0 grms.). M. S.: If 2 hrs. after taking potion the worm not passed, take *ol. ricini*.—*Kamala*, 3iis (10.0 grms.); *ext. male fern*, 3i $\frac{1}{4}$ (5.0 grms.). Mix. To make 28 capsules. 8: 4 caps. ev. 15 mins.—*Palletterine tannate (Tunret)*, gr. vj (0.40 grm.), in caps. or syr., after fasting and lavage of colon, fol. by castor-oil. i. F-6. *Kamala and oil of male fern*.—“*Schafhirt's prescription*”: *Pomegranate, bark of root, pumpkin-seeds, ext. male fern, powd. ergot, ol. tiglio, acrisin, water*. M. *Thymol*, 3ij (8.0 grms.) in 12 dos., one ev. 15 mins.; *castor-oil* bef. and after. i. F-7. *Chlorof.*, *ext. male fern*, $\frac{1}{2}$ 3j (4.0 grms.); *castor-oil*, 3iis-ij. M. *Chlorof.*, 3j (4.0 grms.); *vr. simpl.*, 3j (30 grms.). M. In 3 doses, 2 hrs. apart, fol. by *castor-oil*.—*Fresh pumpkin-seeds (decocct.)*, 3j (4.0 grms.); make emuls. of 3ij (8.0 grms.); add *syr. aether.*, M xl (2.66 grms.). M. For children and delicate women: *Ext. male fern*, gr. j (0.45 grm.); *calomel*, gr. $\frac{1}{4}$ (0.05 grm.). M. In capsule. Take 3 at a time at interv. of 15 mins.—*Ext. male fern* with *calomel*, sug. and gel.—*Moussetta, powd. bark*, 3i $\frac{1}{2}$ -ij (40-60 grms.), alone, in honey, or milk, or in infusion.—Made also into bread with flour. i. F-8. Light meal in evg.; at bed-time, 20 min. apart in 2 doses: *ol. Alica mar. oth.*, 3ii-ij (8-12 grms.); *emuls. amygd. dulc.*, ad 3vj (180 grms.). M. Next morn. at 5 o'clock, 2 tablesp. *castor-oil*; one hr. later, another tablesp.—*Areca-nut*.—*Cocco-nut*. i. F-9. *Areca-nut, powd.*, 3i-ij (4-8 grms.); gr. cccxxv-coclxxv (15-25 grms.) in milk, after 12 hrs. fast, fol. by *castor-oil, infus. sennae*, etc.; restricted diet bef. med.—*Areca-nut*, dose should not exceed 3i-ij (4-6 grms.).—*Coros nucifera*. i. F-11, 12.
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ALVEOLAR ABSCESS. If attack cannot be aborted: extract the tooth promptly, iii. K-44.
ANESTHETICS IN. *Cocaine*. *Cocaine sol.*, made with *suhl. sol.* (1-5M%). *Cocaine sol.* (5%), not more than gr. j (0.05 grm.) to be injected at once; after one-half hr., dose can be increased to gr. ij (0.15 grm.). Several punctures, sm. quant. in each, immed. extraction. iii. K-45. *Cocaine* in oil or liq. vasel.—*Avoid cocaine in hemophili*.—Give ammonia if unpleasant symptoms.

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THERAPEUSIS.

URIC-ACID DIATHESIS.

Dimin. forma. of uric ac., urea, and acids, as far as compat. with healthy funct., and also dimin. acidity; reduce animal fd., use fruits and veget., avoid beer and wine; exercise; *salicylates*, iron, lead, min. acids and their salts, *antipyr.*, *nitro-glyc.*, *op.*, *morph.* i. G-47. Common salt in fd. i. G-50. Mineral waters, at interv. during the day. Waters of Fachingen, Kronenquelle, Grand Grille (Vichy), Bilin, Lutiusquelle (Tarasp), Oberbrunnen, Assmannshausen, Salvator (Eperies), Konigquelle (Wiedungen), Buffalo Lithia Spring. Lithiated hydrangia.—Exercise and open-air life; forced inspira. i. G-51. *Lithium iodide*, v. A-23. *Lithium carbonate*, gr. iii-iv's (0.20 to 0.30 grms.), v. A-76.

URTICARIA.

Consider suscep. of skin and exciting agencies. No drug lessens suscep. Op. in sm. dos. long contin., in chr. cases. Treat on genl. principles. *Chloral* or *bromide*, to secure sleep. Remove all poss. sources of ext. irrita.—Baths, sea-water or medicated: light sponge with tep. wat. fol. by gentle drying.—In pustular cases: unqt. *hydrarg.* ammon. dil. or paste is best. Oints. of *styrax*, of ammon. mur. in cold-cream: of liq. carb. deterg. in sicc vint.; or eq. pts. of act. bellad. and *calom.* vint.; or of *staphisag.* are inferior. In purely papular cases: lotions (evap.), *chlorur.*, sod. carb., carabolic-benzoin (1-248) acid, subl. tinc. sup., ol. *cadini* in water; best is teasp. to a pint (500 grms.) of a mixt. of liq. *plumbi subacet.*, 1 pt.; liq. carb. deterg. 5 pts.—Sponge contin. with wk. ac. acet. or wk. spirits—powders.—Sponge with spts. camph. 2 t. d. fol. by dust of pulv. camphor. iv. A-42. If guttro-intest. disturb.: biem. carb. with magnes. carb.; if constipation: add magnes. sulphate. iv. A-43. Ammon. sulpho-*ichthyolat.* (5%), iv. A-58. *Antipyr.*, gr. viii-xvj (0.52-1.04 grms.). iv. A-60. *Antipyrin*, v. A-12. *Ichthylol*, v. A-64.

UTERINE DISPLACEMENT.

ANTEFLEXION. For dysmenorrhœa and sterility present: Scarifica. just bef. menstr., where ut. is sensitive; dilata. and treat. of complica.—*Ichthylol* vint. to clear up old adhes.—Rapid dila.—Spiral-wire elastic-stem pessary. ii. F-21.

PROLAPSUS. Ant. and post. colporrhaphy.—Astring. tamp.: lat. abdom. posit., and inject. of *strychn.* into vagin. tiss.—High amputa. of cerv., with attachm. of stump to vag. wall (Martin's meth.).—Vag. hysterectomy, with resect. of redundant vag.—Ventro-fixation in extreme cases, as adjunct to other meas., as colporrh.—Massage (Brandt's meth.). ii. F-24. Avoid artif. prolapsus for facilitating exam. ii. F-25. Rectal douche, i. D-15. *Electrol.*, v. C-12. *Anemoneine*, gr. 1-12 to $\frac{1}{2}$ (0.05-0.20 grm.), v. A-7.

RETROVERSIONS AND FLEXIONS. Acute: Knee-chest. position and colpoxynter in rectum.—Byford's meth.—Schultze's meth. Frommel's meth.—Schücking's vag. suture. ii. F-21. Alexander's op., ii. F-22. Hysteropexy. ii. F-23. Kelly's op.—Dudley's op. ii. F-24. *Electrol.*, v. C-12.

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BACTERIA IN URINE: Hartge, i. G-59. Neumann, Wechselbaum, Kendall, Santwood, Lèques, i. G-60. GERMICIDAL PROPERTY OF URINE: Lehmann, Ritcher, i. G-59. UREA, FERMENTATION: Moore, Miquel, i. G-59. URINE AS A CULTURE MEDIUM: Heller, i. G-58; Löfller, i. G-59.

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URTICARIA: T. Colcott Fox, Bateman, iv. A-38; Crocker, Fox, Hutchinson, Hebra, iv. A-39; Fox, iv. A-40; Fox, Gee, iv. A-42; Fox, iv. A-43.

UTERINE DISPLACEMENT—ANTEFLEXION: Harrison, ii. F-20; Mulheron, Reeves Jackson, ii. F-21. GENERAL CONSIDERATIONS: Noble, Runnels, Martin, Bates, Wilson, Gervis, Godson, Jackson, Jakins, J. R. Haynes, ii. F-20. PROLAPSUS: Hirst, Will, Cushing, Martin, Coe, Demoret, Chaput, Vaton, Oseane, Bandois, Engström, Brandt, Schaeffer, Frederiq, Fellner, Doederlein, Sprague, Vulliet, Schurig, Ziegenspeck, Müller, Hattappel, ii. F-24; Philippeau, Logothetis, Goldspiegel, Arendt, Swiecki, Berczeller, Rivière, Taylor, Coe, ii. F-25. RETROVERSIONS AND FLEXIONS: Johnson, Byford, Schultze, Smith, Frommel, Schücking, ii. F-21; Alexander, Carpenter, Schwartz, Alloway, Fry, Terrillon, Braham, Edebohlis, ii. F-22; Boldt, Baudoin, Faucon, Debayle, Bianu, Gross, Delétroz, Lakhnitsky, Eastman, Leopold, ii. F-23; Pozzi, La-royston, Assaky, Roux, A. P. Dudley, ii. F-24.

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THERAPEUSIS.

UTERINE TUMORS.

CARCINOMA AND SARCOMA. *Electric*: Strang. galv. curr. up to 1000 milliamp., ii. F-35. *Medical*: *Chian. turpentine* int.—*Sol. Listerine* (1-4) locally. ii. F-35. *Surgical*: High amputation of cervix, ii. F-35. H. A. with scissors if ent. remov. of dis. port. poss.; if not, vaginal hysterect.—Actual cautery.—Vaginal hysterectomy. Pawlik's op. ii. F-36. When pregnancy present: Vaginal hysterect. before $4\frac{1}{2}$ mos., where condit. are favorable; after $4\frac{1}{2}$ mos.: unless carcin. far adv., induce abortion; if carin. sur adse.: Freund's op.; if total remov. of carcin. imposs., or term is reached: Porro's op., with extra-perit. fixa. of stump; if labor begun, and only 1 lip of cerv. involved, and os dilatable: curette or excise growths, disinfect; end labor by version or forceps (if fœt. is living) or by perfor. and cranio-clast (when fœt. is dead); if rigid cervix: do Cesar. sect. ii. F-39.

FIBROMATA. *Electric*: Galvan., 75-150 milliamp. ev. 4 d., ii. F-26; 30-230 milliamp., constant curr., ii. F-27. Farad. cur., ii. F-26. *Forcible dilatation*, with cureting, ii. F-28. Intra-capsular sloughing, ii. F-33. *Medical*: Ergotin and ergotinin.—Meat and hot-wat. diet (Salisbury system). ii. F-26. *Oöphorectomy*; the operation of election if ovaries can be reached, ii. F-30. *Supra-vaginal hysterectomy and myomectomy*, if larger interstitial or subserous tumor, with severe symptoms, or in smaller tumor, not amen. to elec., vag. enuel. or remov. of appendages. ii. F-30. *Vaginal enucleation in submucoous or polypoid, not too large, and cervix dilatable*, ii. F-29. *Vaginal hysterectomy*, if small multiple tumors, ii. F-30. *Electrol.*, v. C-11.

MYOMATA. *Electrol.*, v. C-11, 21.

VAGINA, DISEASES.

ABSENCE, CONGENITAL, with retention of menstrual fluid: Evac. by punct. of ut., trocar plunged betw. ut. and rectum: plastic op. for form. of vagina.—Remove tubes and ovaries.—Plastic op.; upper vag. wall from m. m. of vestibule, lower vag. wall from skin of perineum. ii. H-39.

ATONY.—Rectal douche, i. D-15.

ATRESIA. Incision, wash out cav. with Thiersch's sol., tampon of iodoform gauze; cover vulva with subl. gauze. Cocaine in oint. (10%), appl. 3 t. d.—Mild contin. curr. of galvano-caut. ii. H-40, 41.

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SYPHILIS. Antisyph. treat. locally: Subl. sol. inject., arg. nitr. caust., resorcin- or iodoform-glycerin tampons. ii. H-45.

TUBERCULOUS. For small ulcers tinct. iod., iodoform, ac. chromic. ii. H-45. Cervical ulcers: Amputa. or ablation of ut. may be necess. ii. H-46.

TUMORS. Immed. removal by knife, ii. H-46.

VAGINAL LEUKOPLAKIA. Freq. alk. inject. with ointments: Starch, zinc oxide, EE 5 pts.; vaselin, 8. pts. M. If epithelomatous, degen.: surg. interference. ii. H-43.

VAGINISMUS. Rectal douche, i. D-15. Electrol., v. C-9.

VAGINITIS. Cleanliness. Lotions of borax and chloral; caut. ulcera.; excise excrencies; ac. benzoic. int., also digitaline, hyoscyamine, aconitine, to combat vascular erethism; abstain from exerc. and coitus. Dip soft sponge into sol. chloral and

AUTHORS QUOTED.

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Kötschan, Hynes, Hyatt, Ransom, Span-ton, F. Engelmann, Greene, Rohé, Whittington, Murfrie, Gubaroff, Broess, Klein, Palmer, Haines, Weiler, Cholmogoroff, Hyatt, Sprague, Graydon, Bevill, Smart, Mann, Pryor, Coe, Baldy, Apostoli, ii. F-26; Apostoli, Gautier, Lucas-Championnière and Danion, Klein, ii. F-27; Skene, Ford, Mundé, Walton, ii. F-28; Terillon, Vaton, Juillard, Vulliet, Chrobak, Martin, Nebel, O. D. Fitzgerald, McMordie, Guéniot, Chun, Sinclair, ii. F-29; Leopold, Chrobak, Leopold, Frank, Martel, Laroyenne, Tait, Wiedow, Leopold, Humphrey, Rabagliati, Kelly and Robb, Rohmer, Edebohl, Faucon, Graff, McMurtry, Mulheron, ii. F-30; A. B. Atherton, G. Bantock, Egan, v. Braun, Byford, Bolt, St. Clair Boyd, Bouilly, N. T. Brewis, Cauchois, Chénieux, Coe, Cushing, R. Douglas, Duret, F. A. Dunsmore, Deletres, Doléris, Edis, Jos. Eastman, Edebohl, Ehrendorfer, Fenton, Goffe, Todd Gilliam, W. Gardner, Galbraith, Guisan, Helmuth, Hartley, Homans, Hirst, Hardon, Irish, Joubert, Kelly and Robb, Krug, Kocher, Logothetis, Laroyenne, McMurtry, J. S. Miller, Merkel, Montgomerie, Merri-man, Mundé, O'Callahan, Polaillon, Mayo, Robson, Schwartz, Ségonz, R. T. Smith, Tait, Tauffer, W. Taylor, Terrier, Trenholme, K. O Werder, W. E. Wilson, Winiwarter, ii. F-31; Irish, Bantock, Frank, Fritsch, Leopold, Leopold and Fehling, Kelly, Richelot, Boisjeux, Polk, Marcy, Goffe, ii. F-32; H. T. Byford, Krönlein, G. R. Fowler, ii. F-33.

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Variola (see Small-pox) i. H- 70	VEINS, DISEASES. SACCULOCATIONS AND CYSTIC DILATATION. If rap. distens., causing pain and threat. hemorrh., rapid coagula. of contained bld. from injury, infl., or other cause; or infl. and suppurr. in dilata., packed with clot: remove entire sac. with adjac. port. of vein; double liga. and division. iii. J-19.	VERATRUM—A. J. Howe, v. A-126.
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Veins, diseases.....iii. J- 18 hemorrhage from portal veiniii. J- 19 sacculations.....iii. J- 18 thrombosis.....iii. J- 20 varicose veins.....iii. J- 21 wounds.....iii. J- 22	VARICOSE VEINS. In young: Brick walk for $\frac{1}{2}$ hr.; tight band around limb above selected point; a few drops of liquid (iodine, 1 pt.; tannin, 9 pts; water, 200 pts.), are thrown into vein by syr. with double canula; withdraw inst., seal orifice with iodoform collod.; leave bandage; rest (absolute) in bed for two wks.—Excision. iii. J-21. Extirpate V. when of small extent; ligation.—Subcut. ligation. iii. J-22. Iodine, v. A-67.	
Venous pulse, ascending (see Heart).....i. B- 29	WOUNDS, OR FEMORAL VESSELS. When vein alone is opened: lat. lig. or sut. if possible; if not, double lig. and divise; raise limb. iii. J-23. If artery is also involved, and is tied: limb in horizon. posit. iii. J-23.	
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	HEMATOCELE. If depend. on varicose vessels, operations generally fol. by phlebitis. If depend. on effus. of bld.: remove by linear excision or excision. ii. H-33. If occurring after labor: absol. rest, subl. douches, ice-bladders in vag. and on peria.; ergotin and morph. hypod.—If gangrene occur: incision. ii. H-34.	
	HOSPITAL GANGRENE. Disinfect. and antisep.; lot. of ac. carbol., ac. salicyl., and glycerin. ii. H-38.	
	KRAUROSION. Excision of dis. ties., removing from both sides of rima strips of epiderm.; include clitoris. ii. H-36.	
	LABIA—ELEPHANTIASIS. Remove by 2 ellip. incis. ii. H-33.	
	PRURITUS. Local anesthetic. If irreg. menstruation: stool, oil. morrh., quin., strych. If nerv. irritation: brom., chloral.; avoid morph.—Granule of ammonium, veratrine, hydroferrocynate of quin. ev. hr.; nour. food, out-door exercise.—Sod. salicyl., gr. xv (1.0 grm.) t.i.d.—Locally: oint. of glycer., amyl 100 pts.; pot. brom. biem. enahrtr. $\frac{1}{2}$ 5 pts.; calomel., 2 pts.; art. bellard., 1 pt. Mix. Or a lot. of sod. burnt., 10 pts.; aq. laurocerasi, 50 pts.; myrs. althaea, 1000 pts. Mix. ii. H-31.	VULVA, DISEASES — CHOLESTEATOMA: Taylor, ii. H-33. COWPER'S GLANDS AND DUCT, INFLAMMATION: Poliacek, ii. H-33; Bonnet, Polaillon, Duchateau, Davis, ii. H-39. CYSTA CANAL OF NUCK: Polaillon, Monnier, ii. H-39. EPITHELIOMA OF VULVO-VAGINAL GLANDS: Buckmaster, ii. H-39. HEMATOCELE: H. Tencate Hodemaker, Lijsterink, Dosimetric Med. Rev., Moussard, ii. H-33; Hare, ii. H-34. HOSPITAL GANGRENE: Herff, ii. H-38. HYPERSTROPHIES: R. W. Taylor, ii. H-31. KRAUROSION: Oliver,

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492. Druggists' Bulletin, Detroit.
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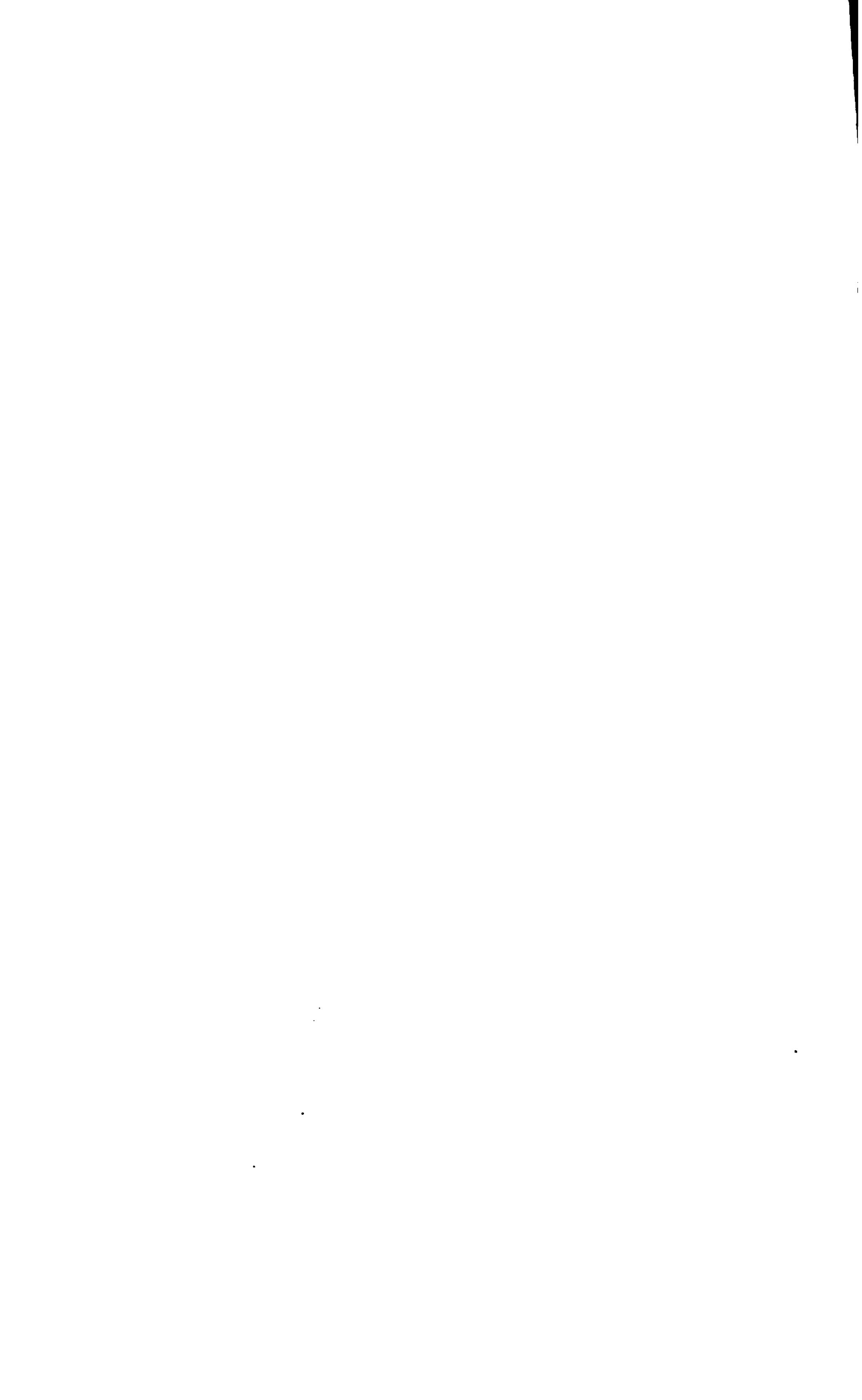
BOOKS, MONOGRAPHS, THESES, ETC.

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PUBLISHER'S ANNOUNCEMENT.

IT is a well-established custom, universally observed among publishers, to insert a greater or less number of advertisement pages at the end of works issued and bound by them. No one questions their right to do this, although, when the added matter occupies too much space in proportion to the size of the book, it sometimes elicits a mild protest on account of the displacement of the index. The publisher of the ANNUAL announced his willingness last year to make the experiment of surrendering this space, which, in this unique and popular work of reference, has unusual value, and of substituting the cards of institutions supported by the medical profession and of business houses engaged in purveying medical supplies. It was argued that if the advertising were limited strictly to the best class of dealers, and the department carefully edited, it would constitute an addition not without interest and value to the thousands of subscribers of the ANNUAL, and, at the same time, enable the publisher, from the increased income thus accruing, to insert additional illustrations to scientific articles, which otherwise might have to be omitted on the score of expense. The experiment was tried last year, and a beginning made which has met with no opposition on the part of our subscribers, but, on the contrary, has been very well received by them, many having expressed their entire approval of the plan and of the results obtained. It is proposed to extend the scope of this department another year, so that it shall present a directory of health resorts and sanitaria of the United States, with some useful data concerning climate and other essential features, from personal inspection, and especially from the stand-point of the patient, wherever practicable. The cards of reputable dealers in medical supplies, surgical apparatus, electrical instruments of various kinds, will also appear, and our subscribers will be urged to deal with these enterprising houses, in acknowledgment of their willingness in co-operating to insure the success of this great undertaking. Owing to the lateness of the hour when it was decided to repeat the experiment for this issue, only a few firms were able to respond to the invitation sent them, most of the others having already made their contracts for the year for the SATELLITE.

In reference to what has just been said, we have no hesitation in inviting the attention of our readers to the following pages. It would be quite proper, in any correspondence growing out of this connection, that notice be taken of the friendly attitude of such firms and institutions toward the **ANNUAL OF THE UNIVERSAL MEDICAL SCIENCES**, and of their desire to contribute toward the growth and development of this representative American undertaking. The **ANNUAL**, however, has many more well-wishers and supporters than now appear in this place, as will probably be made manifest in succeeding issues of this standard work of reference and record.

EDITORIAL NOTE.

In the management of successful medical journals, it has been found advantageous to devote a number of pages to advertisements of institutions and firms who desire to deal with physicians. Where due discrimination is exercised, the advertising pages are not the least interesting and valuable part of the periodical. By their aid the physician is kept apprised of the advance in the mechanic arts so far as they can be applied to his purposes. He learns of new appliances invented to overcome difficulties that he had long experienced, to remove obstructions from his path, and to make his work easier. He is also kept posted as to the latest advances in pharmacy and the most recent acquisitions from the laboratory. New books, new methods, new teaching, new health resorts and sanitaria are passed in review; and in his daily work, when he has occasion to supply himself with a new remedy or instrument, or to send a patient to a health resort, the advertising pages serve as a convenient directory to what he wants.

It was to considerations such as these, added to the fact that the **ANNUAL** is in the hands of the most successful, and therefore the busiest, members of the profession throughout the United States, that led to the institution of this department of this extensively-used work of reference. The number of pages is very limited, and only the most representative firms and institutions, therefore, can be admitted. In the development of the idea which has just been outlined lies the possibility of great advantage to those who use the **ANNUAL**, and who wish it to be placed upon an enduring and sound financial basis, admitting of greater expenditure of money and labor in preparation without increase of subscription price. The interests of all concerned may be mutually advanced, without loss to any, by this new department of Medical Polytechnics and Sanitaria.

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JULIUS FEHR, M.D.,

HOBOKEN, N. J., JUNE, 1891.

ANCIENT PHARMACIST.

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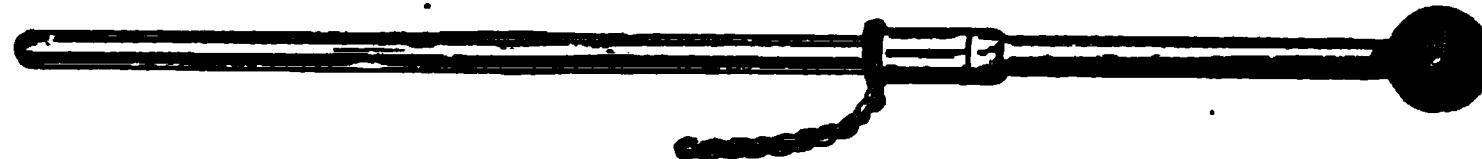


FIG. 16.—BALL ELECTRODE FOR ADMINISTERING FRANKLINIC SPARKS.

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FIG. 117.—PAROTID AND SUBMAXILLARY FISTULE IN THE HORSE, AFTER COLEM.
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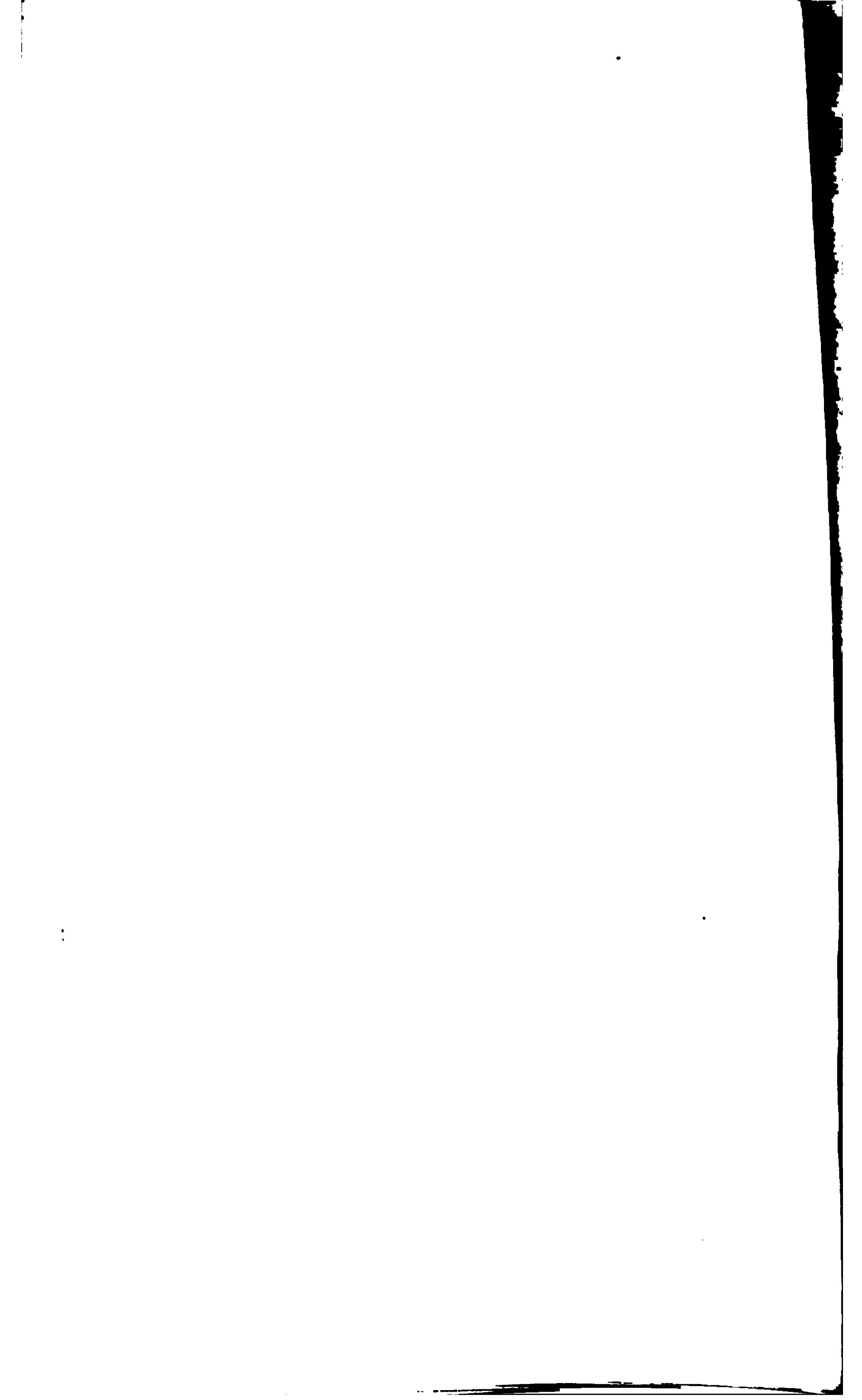
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